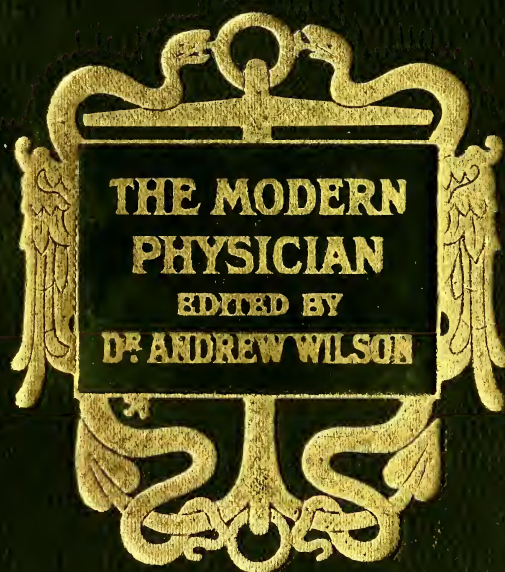
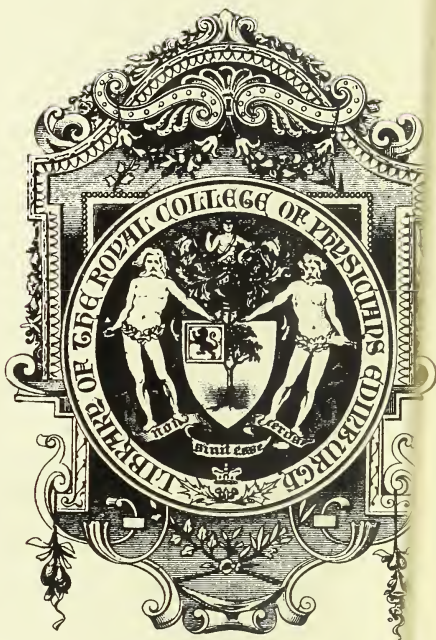




**THE MODERN
PHYSICIAN**

EDITED BY
DR. ANDREW WILSON

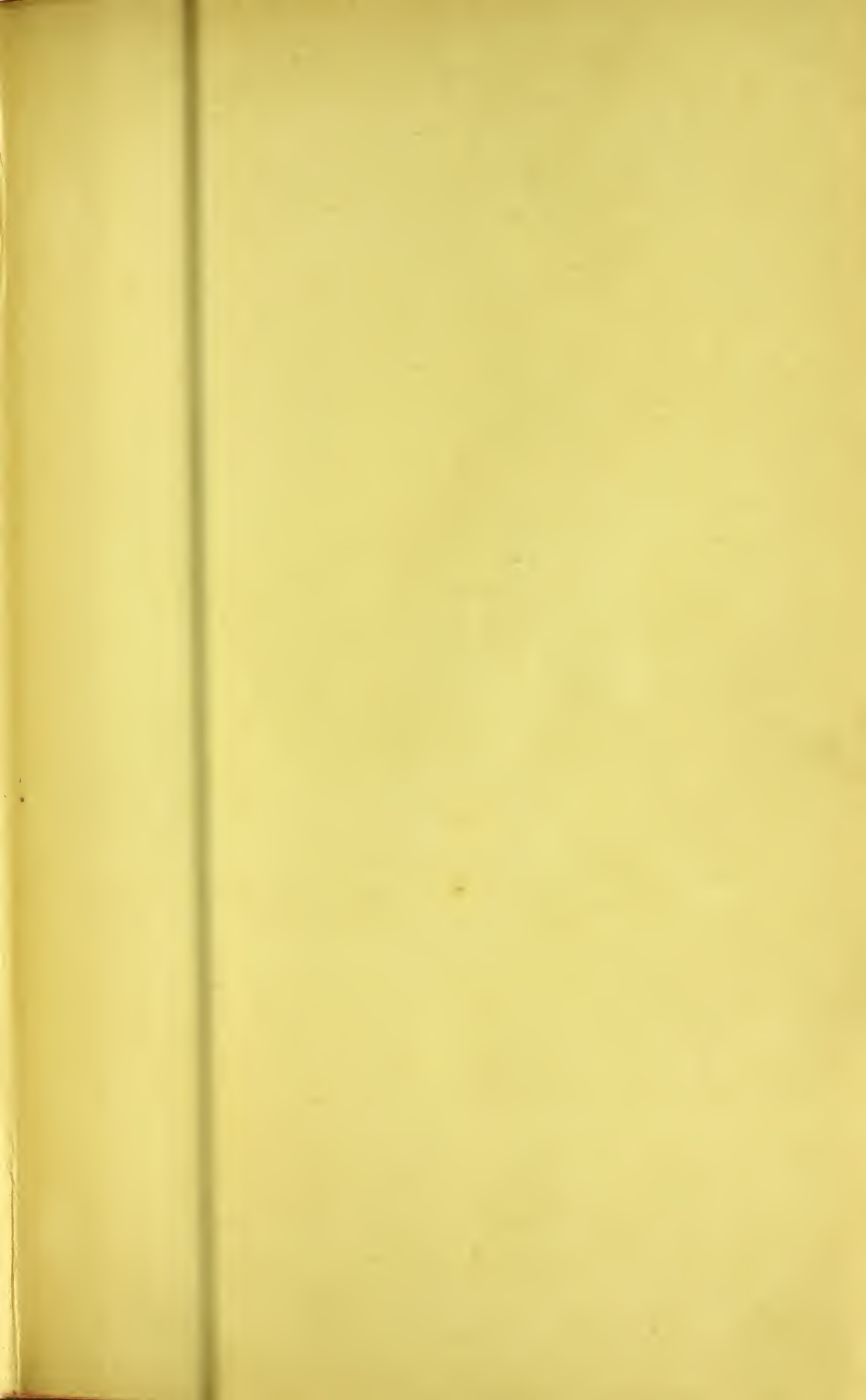


Bj 5.7

R.C.P. EDINBURGH LIBRARY



R24412L0236







SIR RICH. DOUGLAS POWELL, BART.

Physician-Extraordinary to the King

Photo ELLIOTT & FRY, LONDON

THE MODERN PHYSICIAN

BEING A COMPLETE GUIDE TO
THE ATTAINMENT AND
PRESERVATION OF HEALTH

Including Descriptions of the Causes, Symptoms, and Cure of Diseases and Ailments;
the Structure and Functions of the Human Body; Sick Nursing and Invalid
Cookery; Hygiene; the Practice of the Laws of Health and Muscular
Development; the Family Medicine Chest; the Care of Children
and Infants; the Health and Ailments of Women;
First Aid or Ambulance Work, etc. etc.

BY

DR. ANDREW WILSON, F.R.S.E., F.L.S., Etc.

LECTURER ON PHYSIOLOGY AND HEALTH TO THE GEORGE COMBE TRUST;
GILCHRIST TRUST LECTURER; FORMERLY EXAMINER IN THE FACULTY
OF MEDICINE, UNIVERSITY OF GLASGOW; FOUNDER AND
LATELY EDITOR OF "HEALTH."

AUTHOR OF "A MANUAL OF HEALTH SCIENCE," "COMMON ACCIDENTS AND HOW
TO TREAT THEM," "MANUAL OF ZOOLOGY," "SCIENCE STORIES,"
"LIFE AND SENSE," "BRAIN AND NERVE," ETC. ETC.

ASSISTED BY A STAFF OF EXPERT CONTRIBUTORS

*Profusely Illustrated by Coloured Plates and Models,
Photographs, Diagrams, and Woodcuts*

IN FIVE VOLUMES—VOL. IV

LONDON

THE CAXTON PUBLISHING COMPANY
CLUN HOUSE, SURREY STREET, W.C.

Printed by BALLANTYNE, HANSON & Co.
At the Ballantyne Press

CONTENTS

SECTION I

THE STRUCTURE AND FUNCTIONS OF THE BRAIN AND NERVOUS SYSTEM

The Elements of the Nervous System—Nerve Cells—Nerve Fibres—The Arrangement of Nerve Cells—Reflex Action—Nervous Mechanism—Inhibition—Nerve Force—The Development of the Nervous System—The Build of the Nervous System—The Functions of the Sympathetic System—Grey and White Matter—The Spinal Nerves—The Roots of the Spinal Nerves—Spinal Centres—The Brain—The Medulla Oblongata—The Cerebellum—The Central Ganglia—The Cerebrum—Brain Lobes—The Build of the Brain—Brain Weight—Brain Functions—The Central Ganglia—The Functions of the Cerebrum or Great Brain—Aphasia—Phrenology pages 1-26

SECTION II

DISEASES OF THE BRAIN AND NERVOUS SYSTEM

Simple Meningitis, or Inflammation of the Membranes of the Brain—Tubercular Meningitis, or Water on the Brain—Apoplexy—Aphasia—Tumours of the Brain—Chorea—Epilepsy—Uræmic Convulsions—Hysteria—Neurasthenia—Headaches—Sleeplessness—Alcoholism.
DISEASES OF THE SPINAL CHORD: Myelitis—Infantile Paralysis—Locomotor Ataxia.
DISEASES OF THE PERIPHERAL OR EXTERNAL NERVES: Neuritis—The Facial Nerve—The Sciatic Nerve—Neuralgia—Professional Spasms pages 26-56

SECTION III

STRUCTURE AND DISEASES OF THE EAR

STRUCTURE AND PHYSIOLOGY: About Sound—The Quality or Timbre of Sound—The Ear Itself—The Outer Ear—The Middle Ear—The Ossicles of the Ear—The Uses of the Ossicles—The Internal Ear—The other Ear Structures—The Mechanism of Hearing. DISEASES OF THE EAR. Diseases of the External Part or "Flap" of the Ear: Eczema. Diseases of the Entrance to the Ear: Boils—Blocking of the Ear by Cerumen or Wax—Foreign Bodies in the Ear—Earaches. Diseases of the Middle Part of the Ear: Chronic Catarrh of the Ear—Acute Inflammation in the Ear—Chronic discharge of "Matter" from the Ear—"Ringing," "bubbling," or "rushing" Noises in the Ear pages 56-74

SECTION IV

INFECTION AND DISINFECTION

THE GERM THEORY—THE SCIENCE OF GERM LIFE (BACTERIOLOGY)—INFECTION AND DISINFECTION: Redi's Experiments—Further Researches—Spallanzani's Work—The Demonstration—Fermentation—The Parallel Case—Germs, Harmful and Harmless. Infection: Modes of Infection—Direct Infection—Indirect Infection—Protection against Infection. Germs and their History: Microbe-Variation. Disinfection, the Prevention of Infectious Diseases: A Caution to Mothers—Notification of Infectious Diseases—Fever Treatment at Home and in Hospital—Home Treatment of Fever—Some Sick-Room Precautions—Disinfection—Infection Details. Disinfection and Disinfectants: A Disinfecting Error—Disinfectants—Heat as a Disinfectant—Chemical Disinfectants—The Disinfection of Houses—After Treatment of the Room pages 74-97

SECTION V

DISEASES OF BONES AND JOINTS

INFLAMMATION OF BONE: Ulceration of Bone or Caries. NECROSIS. RICKETS AS A BONE DISEASE: Clothing—Ventilation—Baths—Medicinally. SCURVY RICKETS. DISEASES OF JOINTS. HIP-JOINT DISEASE pages 98-108

SECTION VI

TROPICAL DISEASES

Plague—Tropical Typhoid—Inoculation against Typhoid—Beri-Beri—Congestion of the Liver—Abscess of the Liver—Bilharzia Disease—Prickly Heat pages 108-115

SECTION VII

VENEREAL DISEASES

Syphilis—Inherited Syphilis—Symptoms of Acquired Syphilis—Hereditary Syphilis—Soft Chancre—Gonorrhœa—Chordee—Bubo and Abscess—Gonorrhœa in Women pages 115-124

Contents

v

SECTION VIII

THE FAMILY MEDICINE CHEST

Varieties of Treatment—Natural and Empirical Treatment—Drugs and Quackery—The Action of Drugs—The Nature of Drugs—Chemistry and Drugs—The Forms of Drugs—Weights and Measures—Fluid Measure—The Metrical System. THE CLASSIFICATION OF DRUGS: Blood Remedies—Other Blood Remedies—Alteratives—Drugs and the Nervous System—Antispasmodics—Heart Drugs—Drugs and the Digestive System—Purgatives or Cathartics—Anthelmintics—Stomachics—Drugs for the Breathing System—The Skin and Drugs—Kidney Remedies—Drugs acting upon the Generative Organs—Drugs for the Eyes—External Remedies—Antiseptics. RULES FOR THE ADMINISTRATION OF MEDICINES: Domestic Measures—Rules for Administration of Drugs—The Period of Administration—Personal Constitution and Drugs—Some Drug Actions—Some Cautions—Age and Doses—Modes of Administration—Prescriptions—Prescription Terms. THE DRUGS MORE COMMONLY USED, THEIR ACTIONS AND DOSES: Drugs and Doses—Acids—Alkalies—Æther or Ether—Bismuth—Caffein—Digitalis—Glycerines—Iodine—Iron—Jalap—Lime—Magnesia—Mercury—Nitre or Saltpetre—Opium—Phosphorus—Quinine—Rhubarb—Salicin—Tar. USEFUL RECIPES: Baths—Medicated Baths—Poultices—Liniments—Lotions—Ointments—Gargles and Inhalations—Powders—Pills—Mixtures pages 124-171

SECTION IX

HOME NURSING

The Nurse: Knowledge—Character—Dress. The Sick-Room: Cleanliness—Warmth—Ventilation—Light—The Bed—Bedding—Water Beds—Bed-Making—Bed-Pans—The Daily Round—What to Observe—Temperature—Pulse—Respiration—Posture—Evacuations. Remedies and their Administration: Medicines—Enemas—Poultices—Fomentations—Blisters—Ice—Baths. Food and its Administration—Bed-Sores—Nursing of Special Diseases—Lung Diseases—Pleurisy—Bronchitis—Asthma—Consumption—Heart Diseases—Dropsy—Kidney Diseases—Diabetes—Skin Diseases—Eye Diseases—Ophthalmia—Nervous Diseases—Fevers—Surgical Cases—Nursing Children—Convalescence—Death pages 171-215

SECTION X

ON PHYSICAL CULTURE

About Muscle—Muscular Work—What Exercise does—Regulation of Exercise—Systematic Exercises pages 215-227

SECTION XI

MASSAGE, HYDROPATHY, AND ELECTRICAL
TREATMENT

MASSAGE. The Movements in Massage: Effleurage—Massage à Friction—Petrissage—Tapotement. Who should Perform Massage?—The Period of Application—Massage and Morals. HYDROPATHY: Definition of Hydropathy—The Action of Water, Internal—The Action of Water, External—The Effects of External Heat—The Application of Water Internally, Drinking Warm or Hot Water—The Internal Use of Mineral Waters. The External Use of Water, Ordinary: The Shower Bath—The Needle Bath—The Pack—Cold Pack. When to Use the Various Appliances. The External Use of Mineral Waters: Peat and Mud Baths. Vapour Baths—Brine Baths—Marine Baths—Gaseous Baths—Sulphur Baths—General Rules to be Observed. ELECTRICITY IN MEDICINE AND SURGERY: Forms of Electricity—How the Currents are Applied—The Uses of Electricity—Conditions in which Electricity is Used—Electrolysis pages 228–240

SECTION XII

COOKING FOR INVALIDS

VARIOUS RECIPES pages 240–248

LIST OF ILLUSTRATIONS

PORTRAIT OF SIR RICHARD DOUGLAS POWELL, BART.	<i>Frontispiece</i>
STRUCTURE OF THE EAR	Page 64
MICRO-ORGANISMS	„ 96
HOME NURSING	„ 176
PHYSICAL CULTURE—I.—VI.	„ 224
FIG.	PAGE
1. AN AMEBA AND AN INFUSORIAN ANIMALCULE	2
2. A MULTIPOLAR NERVE CELL	3
3. A NERVE CELL OR NEURON	3
4. A PYRAMIDAL CELL FROM THE BRAIN	4
5. A MULTIPOLAR CELL FROM THE SPINAL CORD	5
6. NERVE FIBRES LARGELY MAGNIFIED	6
7. SECTION OF WHITE MATTER OF SPINAL CORD	6
8. DIAGRAM OF REFLEX ACTION	7
9. SCHEME OF CONNECTION BETWEEN A BRAIN CELL, A SPINAL CORD CELL, AND THE BODY	9
10. GENERAL VIEW OF THE CEREBRO-SPINAL NERVOUS SYSTEM (FROM BEHIND)	11
11. THE SYMPATHETIC NERVOUS SYSTEM	12
12. THE BRAIN AND SPINAL CORD	13
13. CROSS SECTION OF SPINAL CORD	14
14. TRANSVERSE SECTION OF SPINAL CORD	15
15. SCHEME OF A REFLEX ACTION	17
16. BRAIN VIEWED FROM ABOVE	18
17. BRAIN VIEWED FROM BELOW	18
18. GROUND PLAN OF BRAIN IN SECTIONS, VIEWED FROM ABOVE	19
19. INNER FACE OF LEFT BRAIN (SECTION)	20
20. LEFT LOBE OF CEREBRUM FROM THE SIDE	21
21. LEFT LOBE OF CEREBRUM FROM THE SIDE SHOWING BRAIN CENTRES	22
22. THE OSSICLES OF THE EAR	61

FIG.	PAGE
23. FORMS OF GERMS	83
24. STREPTOCOCCUS PYOGENES AND BACILLUS OF ANTHRAX	84
25. YEAST	84
26. TETANUS BACILLUS	84
27. TYPHOID BACILLUS	85
28. BACILLUS COLI COMMUNIS	85
29. MEDICINE CHEST	154
30. CLINICAL THERMOMETER	185
31. A TYPHOID RECORD	186

THE MODERN PHYSICIAN

SECTION I

THE STRUCTURE AND FUNCTIONS OF THE BRAIN AND NERVOUS SYSTEM

THE *nervous system* of an animal is that series of organs which brings its possessor into "relation" with the outer world. Hence the nervous system is said to exercise the function or duty of "relation." It is through the medium of this system that the living being is capable of adjusting itself to its surroundings, of guiding its movements from place to place, of obtaining food and of controlling the processes of life at large. The nervous system in this view of matters governs the bodily kingdom. In plants a nervous system has not been demonstrated to exist, but as the property of "nervousness," or "irritability" as it is also called, is one possessed universally by protoplasm (or living matter), we can readily understand that in plants, as in the lowest animals where a nervous system is absent, they may, through the action of their living matter, be capable of exercising the functions of relation. Thus, in the case of a simple animalcule like the "amœba" (Fig. 1, *A*), whose body consists of a speck of living matter, we find that when a particle of food touches the margin of its body it immediately invests the particle, and on thus taking it into the body's interior digests it. Here we find represented an elementary sense of touch which, of course, ministers to the nutrition of the animal. It may be said that all plants in virtue of their possessing living matter exercise nervous functions. In their case, however, it must be regarded as of a general or diffused character, and thus presents very great differences from cases in which specialised portions of the living matter of an animal are developed in the shape of nerve cells and nerve fibres. Many plants under the influence of cold close their petals, opening them again when more genial weather prevails. In addition, however, we find certain plants possessing well-marked sensitive powers. Thus the Sundew and the Venus' Flytrap capture insects for food by means of their sensitive leaves.

The Modern Physician

Still more curious is the case of the Sensitive Plant, or *Mimosa*. This plant droops its leaves on the slightest touch, re-erecting them when the irritation has passed away. This plant is indeed more sensitive than are many animals, yet, no trace of a nervous system having been detected in it, we are left to suppose that the seat of its nervous powers is to be regarded as represented by the general protoplasm or living matter of its cells. Yet another interesting fact may be noted regarding the Sensitive Plant. If it is subjected to the action of chloroform or ether it may be rendered perfectly insensible. When it has thus been narcotised, the leaves which previously would have drooped on the slightest touch remain impervious to the roughest

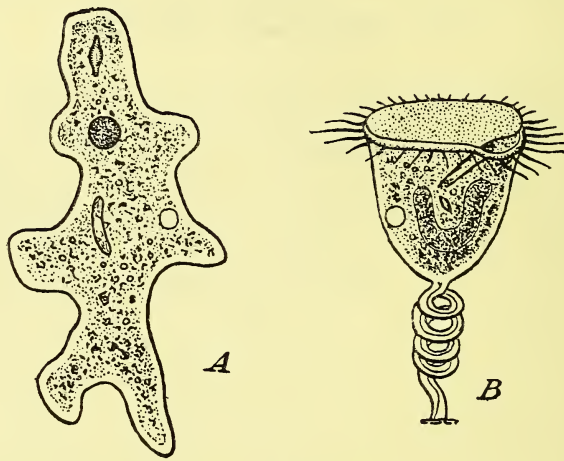


FIG. 1. — A, an *Amœba* (highly magnified), a low animal composed of a minute mass of Protoplasm; B, an Infusorian Animalcule showing movement of coiling on its Stalk.

usage. After the influence of the narcotic has passed away the plant once more exhibits its usual irritability. It is, to say the least, a striking fact that a substance which robs the brain cells of man of their sensitiveness should produce a similar result on the living matter of the plant.

The Elements of the Nervous System.—It will be understood that the essential feature of a nervous system is the development therein of highly sensitive living matter. This matter is disposed in the shape of two elements, of which latter, indeed, the nervous systems, equally of high and of low forms of life, may be said to be composed. These elements are known as *nerve cells* and *nerve fibres*. In order properly to appreciate the distinction between these two primary elements of the nervous system, we may liken its organs

to a telegraph system itself. The essential features of the telegraph consist, first, of means for producing an electrical current, and, second, of conductors for the conveyance of this current, certain effects being produced at either end of the conductor. This conductor in the case of the ordinary telegraph is a wire, the current being supplied by an electrical battery. It is obvious that the wire has no power to originate the message it conveys. It is a mere conducting agent, and no more. The essential element in producing the message, or at least the source of energy conveying the message, is the battery. If, now, we compare the nervous system to the telegraph, we discover that the essential elements in transmitting, receiving, or altering messages are *nerve cells*. *Nerve fibres*, of which each nerve is built up, can only play the part of wires in that they transmit or

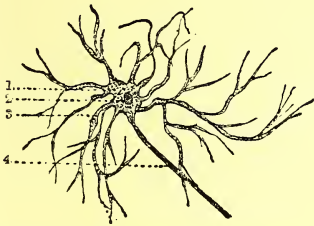


FIG. 2.—A Multipolar Nerve Cell.
1, Its body; 2, its Nucleus and Nucleolus; 3, its Branches; 4, the Axis Cylinder of a Nerve Fibre.



FIG. 3.—A Nerve Cell or Neuron, showing its many *dendrites* or branches.

convey the messages. Out of these two elements it will be understood, the simplest and the most complex nervous systems are alike built up.

Nerve Cells.—Dealing first with *nerve cells* as the more important of the two elements, we find that they represent in their way a highly important group of bodily workmen. In the section of this work devoted to the consideration of the body and its constitution, the nature of “cells” will be found duly explained. It is only needful here to remind the reader that “cells” are the veritable workmen of the body, discharging all the active duties through which the life of the individual is maintained. Nerve cells constitute the highest group of these bodily elements. Amongst them, however, we find in turn various ranks or grades. Thus a cell belonging to that part of the brain which is concerned with the highest mental operations, must be regarded of superior rank to those whose duty it

is to govern the action of muscles. One might, indeed, compare the nervous system at large to the Parliament or governing body of the frame. The higher cells of the system might then well be compared to the Cabinet, constituting the more important body which exercises the true functions of an executive Government.

Nerve cells (Figs. 2, 3) vary in size from the $\frac{1}{100}$ th to the $\frac{1}{500}$ th part of an inch or less. Each is a minute mass of protoplasm. Within each cell can be seen a central particle or *nucleus* (Fig. 2, 2), and within this latter, or attached to it, a similar particle called the *nucleolus*, can be discerned. It is a characteristic of nerve cells that, from the body of a cell, we find processes or filaments given off. These may, in certain cases, exhibit elaborate branching. In some nerve cells two processes only may be given off, whereas others exhibit a large number of such branches. The nerve cells have been called *neurons*, and their branches *dendrites* (Fig. 3). Nerve cells giving off many processes are called *multipolar cells* (Fig. 2). A very typical shape of brain cell is that exhibiting a pyramidal form (Fig. 4), these cells being otherwise called *tripolar cells*. *Multipolar cells* are commonly found in the spinal cord (Fig. 5), which represents the continuation of the brain downwards, and which, as the main line of the nervous system, lies protected within the spinal column. It will be understood that, whilst the nerve cells represent the seat of nervous activity, originating, receiving, and reflecting messages, their "dendrites" or branches are destined to place them in communication with neighbouring cells with which their functions are closely identified. From many nerve cells, however, we also find given off a special process which does not divide or branch, and which is continued from the nerve cell to become the fibre of a nerve (Fig. 2, 4 and Fig. 5, a). It is by means of this particular process that messages are conveyed from a nerve cell to the body; the ordinary branches or "dendrites," on the other hand, conveying messages from cells to neighbour cells. Through the progress of microscopical

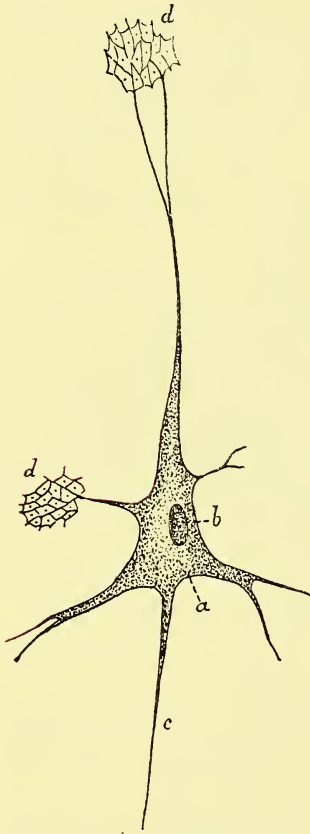


FIG. 4. — A Pyramidal Cell from the Brain.

a, Body of Cell; b, Nucleus; c, the Branch which becomes a Nerve Fibre; d, d, the Fine Network of the Branches.

investigation, and through the adoption of elaborate methods of staining nerve tissues, the connections and structure of nerve cells have been ascertained with a high degree of accuracy. Also in the investigation of brain diseases it has been found possible, not merely to locate the existence of such ailments in the brain or other part of the nervous system, but actually by aid of the microscope to note the changes in the cells themselves, which have been produced as the result of the diseased action.

Nerve Fibres.—Turning now to the construction of *nerve fibres* which represent the conductors of the nervous system, or in other words, its wires, we find that each nerve is composed of bundles of these fibres (Fig. 5, *a*). Viewed under the microscope, the nerve fibre (Fig. 6) presents us with three distinct parts. There is first of all a delicate sheath called the *neurilemma*, investing the fibre. The outer part of the fibre itself is formed by a particular tissue, known as the *white substance of Schwann* (*b*). The essential part of the fibre consists of delicate protoplasm, called the *axis-cylinder* (Fig. 6, *a*). This last is the most important part of the fibre, and is undoubtedly that part which conveys the messages coming from the nerve cell, one of whose processes, as we have seen, passes out and becomes the central part of the fibre itself. In one part of the nervous system, known as the *sympathetic system*, the fibres are found to want white substance. This is also the case with the nerves of smell. The prevailing opinion amongst physiologists is that the white substance of a nerve fibre serves to insulate it, very much as a wire is insulated by a coating of indiarubber, so that messages conveyed by one fibre to a muscle or other part are not interfered with by those conveyed by neighbouring fibres.

The Arrangement of Nerve Cells.—With regard to other arrangements connected with the elements of the nervous system, it may be remarked that in the brain and in other parts of the system, groups of nerve cells can be shown to be closely and intimately

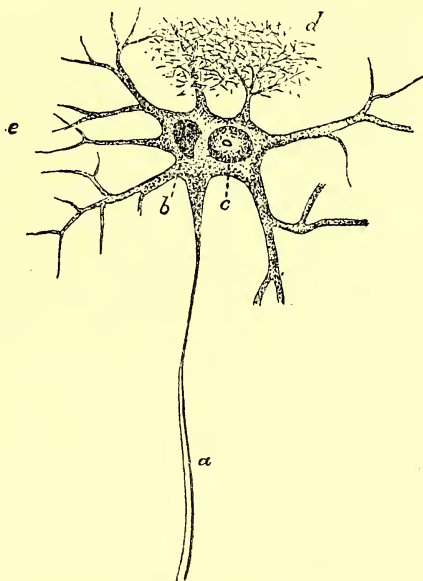


FIG. 5.—A Multipolar Cell from the Spinal Cord, showing *a*, Nerve Fibre; *b*, Pigment; *c*, Nucleus; *d*, the Fine Network of Branches of Cell; *e*, Branches of Cell.

connected together. We presume, in such a case, that the functions of these cells are of a similar or nearly related nature; hence such collections of nerve cells are often spoken of under the term of *nerve-centres*. The term *ganglion* may be regarded as possessing much the same significance as a "nerve centre," for under the former term we speak of several masses of nerve cells united closely together, and provided with special and distinct fibres passing to and fro from the cells. A "ganglion" may therefore be looked upon as a specialised portion of the nervous system set apart for the discharge of a special duty.

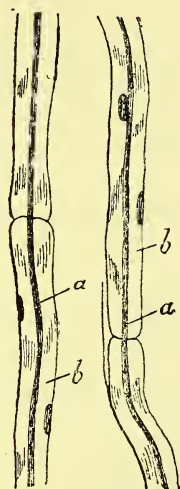


FIG. 6.—Nerve Fibres largely magnified.

a, The Axis Cylinder;
b, White Matter.

Reflex Action.—It may be said that the understanding of the general working of the nervous system depends on our appreciation of a fairly simple principle, which appears to be universally represented in the physiology of this portion of our frames. We have seen that nerve cells are the originators and receivers of messages or impressions conveyed by nerve fibres to or from the cells. The principle on which the nervous business of the body, so to speak, is carried

on is that known as *reflex action*. Taking a simple instance of nervous work we may select, by way of illustrating the principle in question, the action of the head being suddenly withdrawn on a blow being aimed at the face, or a hand being suddenly passed in front of the eyes. This is one of those actions practically performed without our having to think over its details at all. It is discharged, in other words, mechanically or automatically, and, being intended as many such actions are, for the protection of the body, is all the more perfectly discharged, because it involves no thought on our part. Indeed, it may be added that a very large portion of the governance of the body is carried out for us, and not by us, on account of the operation of the principle we are discussing. That which happens on withdrawing the head from a threatened blow is first the transmission of a message from the eye as a "gateway of knowledge" (Fig. 8, S) along the nerve of sight to a particular part of the brain destined to receive messages from the eyes. From this sight-centre, the message is



FIG. 7.—Section of White Matter of Spinal Cord, showing Nerve Fibres cut across each with Central Axis Cylinder, and two Cells (dark) of the Neuroglia or ground substance of the Nervous System.

“reflected” to the part destined to be brought into action, namely, the muscles (*M*) of the back of the neck, which withdraw the head out of the reach of danger. Another example of reflex action may be found in the action of crossing the street rapidly on hearing the sound of a vehicle approaching us. Here the ear is the “gateway of knowledge,” and from the ear there is transmitted to the hearing-centre of the brain a message which in its turn is “reflected” to the muscles of the body and legs, quickening our movements, so as to enable us to escape the danger of being run over. If the mouth “waters” at the sight of something good to eat we similarly find a message, conveyed by the eyes, “reflected” to the salivary glands whereby they are stimulated, with the result of pouring their secretion into the mouth (Fig. 8).

Reflex actions such as have been described may not always end or terminate in the same simple manner described. If, for example, a person should resent a blow aimed at him, reflex action might not necessarily cease with the withdrawing of the head, but might be propagated to the muscles of the body and legs, carrying the threatened individual out of the reach of danger. On the other hand, if he thought fit to tackle his adversary, the reflex might spread to the muscles of his arms, whereby he would be able to show fight to his opponent.

Nervous Mechanism.—In order that “reflex action” may be carried out, we find the constitution of the nervous system presenting us with a definite scheme, whereby all the wants of the body in respect of instantaneous results can be brought about. What is required for the carrying out of reflex action is first of all a receiving office or part (such as an organ of sense) (Fig. 9, *S*) capable of receiving an impression; second, a nerve cell or cells (Fig. 8, *M.C.*), to which the impression is conveyed, and by which it is “reflected”; and in the third place, a second nerve fibre conveying the reflected message to the muscle (*M*) or other organ destined to be brought into action. The nerve fibre carrying the impression inwards to the nerve cell or centre

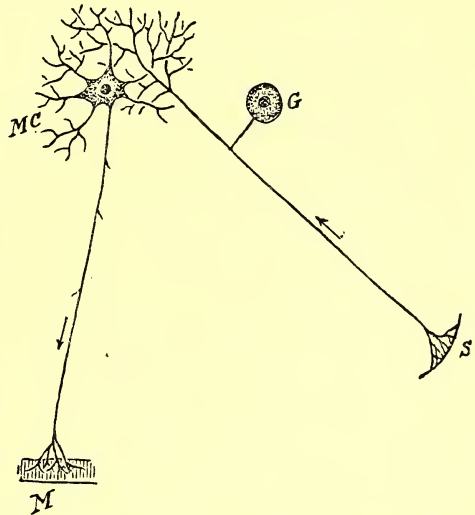


FIG. 8.—Diagram of Reflex Action, showing *MC*, Nerve Cell; *M*, Muscle; *S*, Skin Surface; and *G*, Ganglion. The Afferent Fibre is that going from *S* to *MC*, and the Efferent Fibre is that going from *MC* to *M*.

is called a *sensory* or *afferent fibre* (Fig. 9). That which carries the reflected message outwards to the body is known as a *motor fibre* or *efferent* one. This description applies of course to the apparatus necessary for the carrying out of the simpler reflex actions represented in our ordinary life. The examples already given represent such mechanisms of the nervous system, just as when the foot of a sleeping individual is tickled, it is withdrawn without the person waking. The main principle of reflex action just described, forms the essence of all such actions, the complications being due not so much to the machinery employed, so to speak, as to the elaboration of ways and means whereby reflexes can be modified, altered, and widely distributed.

Inhibition.—We find, however, that it is possible for the action of the nervous system just described to be in many cases modified by the action of the will, or other circumstances. Thus a person who determines not to wink when a hand is suddenly passed before his eyes may cause the reflex action which closes the eyelids to be stopped, or, as the phrase goes, to be “inhibited.” On the other hand, those actions which have for their special object the preservation of the body from injury are often incapable of being so repressed. Darwin tells us that, on one occasion pressing his face close to the thick plate glass front of a cage in the reptile house of the London Zoological Gardens, wherein were contained several of those poisonous snakes known as the cobras of India, he was unable, notwithstanding his perfect sense of security, to avoid drawing back his head when the snakes struck against the glass. Here the idea of self-preservation was too powerful for the inhibition of the reflex action to be effected by the exercise of the reason. In India a test carried out by the native priests for the detection of a thief is that of summoning all the servants of a house, and of placing a teaspoonful of rice in the mouth of each. After sundry prayers and incantations on the part of the priest, which have the effect, no doubt, of impressing the subjects with the idea of supernatural powers, the rice taken from the mouths of the servants is examined. As a rule it is found that whilst the rice in the case of the innocent persons is duly moistened with saliva, that of the thief or thieves remains dry. Here again the natural reflex which causes saliva to be poured on food received into the mouth is inhibited by the fear of detection.

Nerve Force.—With reference to the nature of the message which is conveyed to or from nerve cells by nerve fibres, we are accustomed to speak of this particular form of energy under the name of *nerve force*. This may be defined as the particular kind of energy which is exercised and originated by nerve cells, and by them

alone. It may be regarded, therefore, as a property of the *protoplasm* (or living matter) of which we have seen nerve cells to be composed. A popular, but most erroneous idea of nerve force is that which regards it as essentially of electrical nature. Whilst both nerve and muscle exhibit electrical reactions, we must be careful in avoiding the error in question. Nerve force is not electricity, but a special form of energy. The rate at which *nerve force* travels has been calculated by means of delicate instruments. It passes at a slower rate in cold blooded animals than in warm blooded ones. In man, and his neighbour animals, the average rate at which our nervous messages are transmitted has been estimated at about two hundred feet per second. It is probable that great variations exist, however, not merely in different groups of animals, but also in different individuals. In persons of what is known as a phlegmatic temperament, whose movements are slowly and deliberately carried out, it is highly probable that the rate at which nerve force travels, and brings muscles and other organs into play, is of slower rate than in persons of a sanguine or active temperament. Similarly in the case of a small animal, like the mouse, we not merely find a quicker rate of transmission of nerve force than in a slowly moving animal, such as the tortoise, but we have also to take into account that, in the mouse, the nerve force has less distance to travel, even when compared with its range in the cat which pursues the mouse.

The Development of the Nervous System.—In the lowest animals, which possess a definite nervous system (represented probably by the jelly-fishes), we find nerve cells and nerve fibres widely diffused. Through the body at large there is an absence, in such cases, of any distinct grouping together of nerve cells into masses. Higher in the animal scale, we find the grouping or concentrating tendency to be represented. In such an animal as an insect or lobster the nervous system, instead of being diffused through the body, consists of a definite chain of nerve masses or ganglia, each

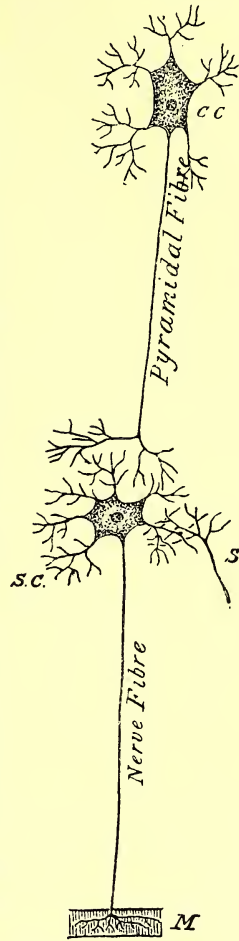


FIG. 9.—Scheme of connection between a Brain Cell *CC*, a Spinal Cord Cell *S.C.*, and the Body *M*. The *Pyramidal Fibre* conveys the impulse to the Spinal Cell *S.C.*, which in turn originates the *Nerve Fibre* to the Body *M*; *S*, is a Sensory Fibre conveying a message from Body *M*. The Dendrons or Branches of the Cells are also shown.

regulating definite movements and receiving impressions from the organs of sense. Even in insects of a higher grade we discover a distinct tendency to mass nerve cells in the neighbourhood of the head. The same feature is represented amongst shell-fish or mollusca. In the mussel and oyster, neither possessing a head, the nervous system is of the diffused type; whereas in the snail, and, still more, in the cuttle-fish, the highest member of the group, we find the principle of centralisation carried out, so that these latter animals, having well-developed heads, possess a prominent nervous mass, which practically corresponds to a brain. Similarly, in the case of backboned animals, the lowest fishes have little or nothing in the way of a brain-mass. In higher fishes, on the other hand, a brain is well developed, and as we advance from the fishes upwards, we are able to discern that the rise of the nervous system is simply due to the larger growth of the brain—that is to the massing together of nerve cells—in the head region, a principle to which the name of *cephalisation* has been given.

It need hardly be added that in the higher apes, and in man, this principle reaches its fullest development. In man himself not merely is the brain-mass much larger, as compared with the body-weight, than in any other animal (save certain small birds), but, as will be shown hereafter when dealing with the brain itself, certain portions of man's brain have, in their turn, attained a degree of development far exceeding that found in any lower form.

The Build of the Nervous System.—In man, and in all other backboned animals, we find the nervous system to present us with a double character. In other words, two distinct but connected systems are included in the anatomy of the Vertebrate body. The first of these systems consist of the brain, the spinal cord (enclosed within the backbone), and the nerves connected with both. This system has received the name of the *cerebro-spinal system* (Fig. 10). The second system is named the *sympathetic system*. It will be convenient to deal with the latter system in the first instance. The sympathetic system (Fig. 11, A) is represented by a double chain of nerve masses (or *ganglia*), one chain running down each side of the spine in front. The number of these ganglia (Fig. 11) is twenty-four or twenty-five. Fibres pass from the sympathetic system to the spinal nerves, which are given off from the spinal cord itself. Below at the coccyx, the two chains of ganglia unite together, whilst above the sympathetic system enters the skull, and becomes connected with the spinal nerves of that region. Special branches of the sympathetic system are given off to supply the heart (Fig. 11, C) and lungs. In the chest distinct nerves, called *splanchnic nerves*, are found;

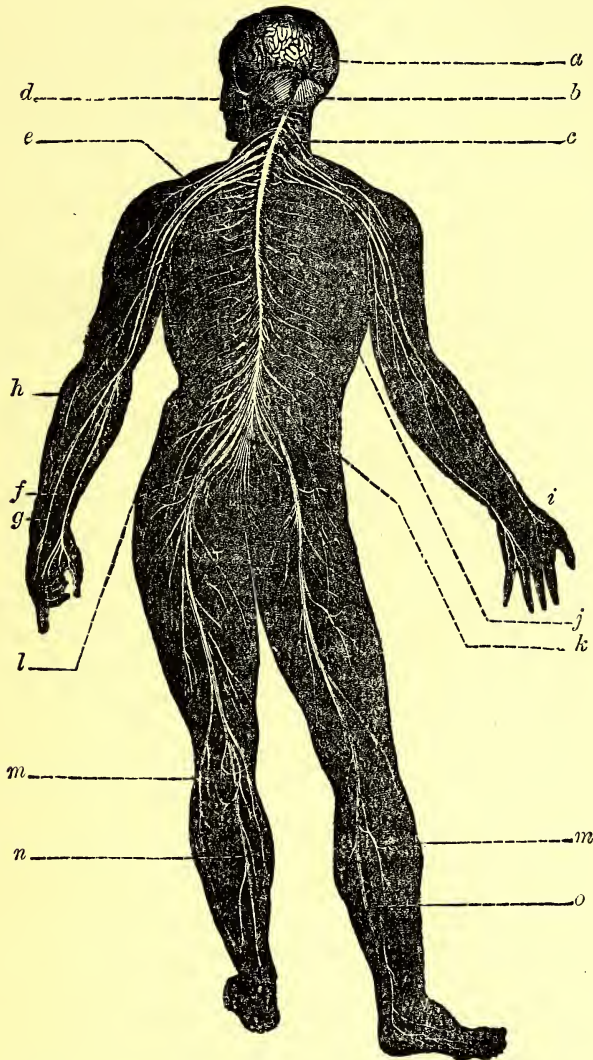


FIG. 10.—General View of the Cerebro-Spinal Nervous System
(from behind).

a, Great Brain, or Cerebrum; *b*, Cerebellum; *c*, Spinal Cord; *d*, Facial Nerve; *e*, Brachial Plexus; *f*, Median Nerve; *g*, Cubital Nerve; *h*, Internal Cutaneous Nerve; *i*, Radial and Musculo-cutaneous Nerve; *j*, Intercostal Nerves; *k*, Lumbar Plexus; *l*, Sacral Plexus; *m*, Nerve of Leg; *n* and *o*, Nerves of Hinder Aspect of Leg.

these uniting to form what is known as a *plexus* (B), or nervous network in the abdomen. It is from this source that branches of the sympathetic system pass to the stomach, bowels, liver, kidneys, and other organs in the pelvis. Another plexus supplies the organs contained in the latter cavity. The sympathetic system, in addition, sends fibres to the blood-vessels, these last being known as *vaso-motor fibres*. As has already been explained, in the section

dealing with the heart and blood-vessels, these fibres are devoted to the regulation of the blood-supply, whilst a special nerve, derived from the sympathetic system, also acts as the stimulating nerve of the heart.

The Functions of the Sympathetic System.—From the distribution of the branches of the sympathetic system of nerves, we may readily conclude that the duty of this system is largely that of regulating those processes of life which are carried on automatically, that is, independently of the will. When we reflect upon the manner in which our vital processes are performed, we note, as has already been remarked, that such actions are controlled not so much by us, as for us. Thus the process of digestion, the regulation of the heart, the control of breathing-movements, and the government of the blood-vessels are all actions

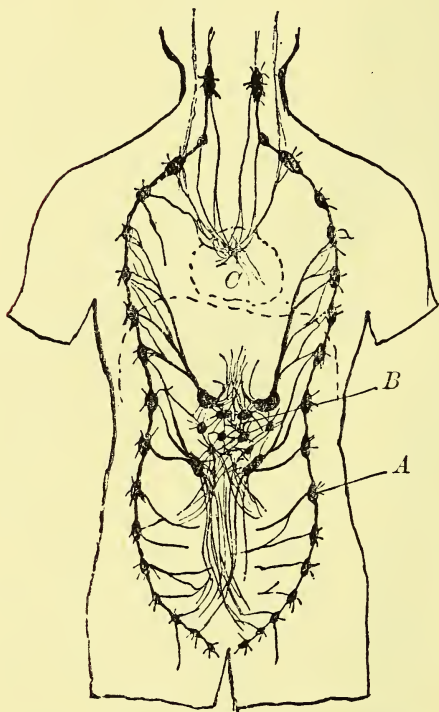


FIG. 11.—The Sympathetic Nervous System.
A, The Ganglia of the System; B, the Solar Plexus; C, Plexus for Heart, &c.

with which, in the healthy state, we have practically little or nothing to do; that is to say, we do not require to exercise active or conscious control over them. Hence it is that a sharp line may be drawn between the brain system of nerves (often called the *voluntary system*) (Fig. 10) and the sympathetic system, which has been termed the *involuntary nervous system* (Fig. 11), or that of “animal life.” The principle here represented is that of the “division of labour” of the nervous system. It is obvious that the saving of the work of the superior nervous system (devoted to the active control of the body) through the action of the sympathetic system,

The Spinal Cord

13

must constitute a very important feature of personal life. In other words, the brain system is the prominent and responsible one, and it is thus left free to devote its attention to the pressing questions of the day and the hour. The purely mechanical work of life, on the other hand, is carried out by the "sympathetic system" of nerves.

The Spinal Cord.—We have seen that the principal nervous system of the body consists of the brain, the spinal cord, and the nerves given off from each. Leaving the consideration of the brain for a later portion of this section, we may find the study of the spinal cord itself to introduce us, in a satisfactory fashion, to the structure and functions of the brain itself.

The *spinal cord* (or *spinal marrow*, as it is also termed) may be regarded as representing the main line of the nervous system (Fig. 12). It lies protected within the bony tube formed by the spine or backbone, and thus resembles the brain, which, in its turn, is protected by the skull. In length the spinal cord varies from fifteen to eighteen inches. It is generally described as averaging in thickness that of the little finger. In certain parts of its length it varies in thickness. Thus, in the lower part of the neck, the spinal cord is thicker than in the rest of its length, with the exception of its lower extremity, where it becomes enlarged at the point of origin of the nerves supplying the legs. Anatomically considered, the spinal cord begins at the great opening in the occipital bone at the base of the skull and extends to the level of the upper border of the second lumbar vertebra, or that of the loins. The cord is enclosed in a series of membranes, or investments, corresponding to those which enclose the brain. These coverings are known as *meninges*. The outermost of the coverings of the cord is a strong membrane, known as the *dura mater*. The middle covering is termed the *arachnoid membrane*. This is a highly delicate structure. The innermost membrane is known as the *pia mater*. It closely invests the spinal cord itself. Between the latter membrane and the *arachnoid* a certain quantity of fluid is found, this being termed the *cerebro-spinal fluid*. The existence of this fluid serves to protect the spinal cord from shock, and the cord

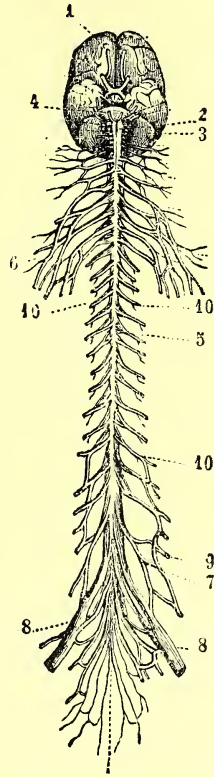


FIG. 12. — The Brain and Spinal Cord.

- 1, Brain; 2, Medulla Oblongata; 3, Cerebellum; 4, Pons; 5, Spinal Cord; 6, Brachial Plexus; 7, Terminal Part of Cord (*cauda equina*); 8, Sciatic Nerve; 9, Lumbar Plexus; 10, a Spinal Nerve.

itself has well been described as existing in a kind of water-bed, whilst alterations in the cord, due to variations in the blood-vessels, are also provided for by the existence of this fluid layer. At the lower end of the cord we find it tapering off into a thread-like process, known as the *filum terminale* (Fig. 12). The spinal cord is also additionally protected from injury by a layer of fat lying between the bony tube, in which it is contained, and the cord itself.

Grey and White Matter.—It may here be mentioned that the term *grey matter*, of the nervous system, is applied to that portion of the system, wherever present, which consists of nerve cells. *White matter*, on the other hand, consists of *nerve fibres*. If we make a

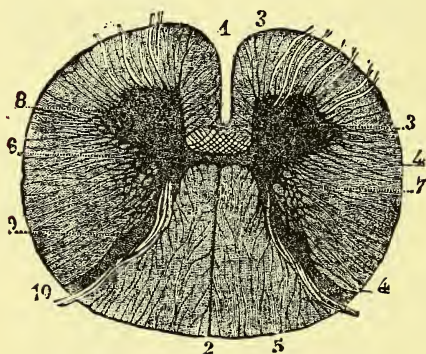


FIG. 13.—Cross Section of Spinal Cord.

- 1, Anterior Fissure; 2, Posterior Fissure; 3, Anterior Column; 4, Lateral Column; 5, Posterior Column; 6, Posterior Commissure; 7, Junction of Grey and White Matter; 8, Anterior Horn; 9, Posterior Horn; 10, Fifth Pair of Spinal (cervical) Nerves.

cross section of the spinal cord (Fig. 13), we find that the "grey matter" exists in the centre of the cord, whilst the outer part of the cord is composed of white matter (Fig. 14, *W.M.*). The cord is almost completely divided into two symmetrical halves by two fissures (1 and 2). The connecting portion of the halves contains in its centre a small canal, known as the *central canal*. This runs through the bridge of grey matter, uniting the two halves, and passes upwards to end in a cavity of the brain known as the *fourth ventricle*. The grey matter consisting of nerve cells, as has been said, is found in the

central part of the spinal cord (Fig. 14, *G.M.*). As seen in a cross section (Fig. 13), it forms two crescents placed back to back and joined by the bridge of grey matter, already described as being pierced by the central canal. This bridge has been called the *grey commissure* of the cord. Looking at each of these crescents, we find that the front portion is larger than the hinder portion, and ends in what is called the *anterior cornu* or *front horn* (8) of the cord. The hinder end of the crescent exhibits a sharp outline, runs nearly to the edge of the white substance of the cord, and is known as the *posterior cornu* (9).

With regard to the white matter of the cord (Fig. 14, *W.M.*), consisting of nerve fibres, we find this portion to be divided into columns by nerves passing from the horns of the cord, and also by certain clefts in it. In the front of the cord the white matter

existing on each side of the fissure in the middle is termed the *anterior column* (Fig. 13, 3). Behind we find the *posterior column* (5), lying between the posterior horn and the middle fissure. The *lateral columns* (4) of the cord lie between the roots of the spinal nerves, to be presently described as issuing from the cord.

Whilst these main divisions of the spinal cord are easily recognised, there are other and more complicated areas defined by the connections of the cord with the brain. In the spinal cord itself, we find the grey matter to be composed of *multipolar cells* (Fig. 5), that is, cells which give off a large number of branches. Those of the front horn of the cord are larger than the cells found in the posterior or hinder section. It is from these anterior or front cells that certain important *motor nerves* are given off. The white matter of the cord, as has been already indicated, consists of *nerve fibres*. As will be presently shown, the white matter contains fibres which pass out to

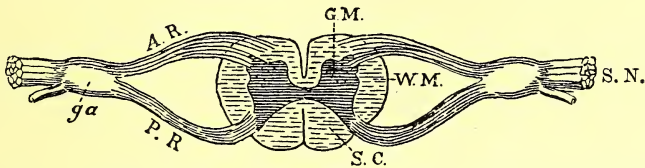


FIG. 14.—Transverse Section of Spinal Cord S.C., showing G.M., Grey Matter; W.M., White Matter; A.R. and P.R., Front and Hinder Roots of S.N., the Spinal Nerve; ga, Ganglion on Hinder Root,

the body, and also others which pass from the body to the cord and to the brain.

The Spinal Nerves.—Thirty-one pairs of spinal nerves (Fig. 12) issue from the cord and represent the branch lines of the nervous system supplying the body. Eight pairs belong to the neck region, twelve pairs exist in the back, five pairs represent the number proper to the loins (or lumbar region), five pairs belonging to the sacral region represented by the bone wedged in between the haunch bones behind. One pair belongs to the coccyx or terminal part of the spine. With regard to their direction, these nerves pass in the upper part of the body outwards in a straight manner. In the lower part of the spinal cord they slope downwards. At the termination of the spinal cord below, we find it ending in a bundle of nerves known as the *cauda equina* (Fig. 12, 7). From this portion the nervous supply of the legs is derived.

The Roots of the Spinal Nerves.—Turning now to the manner in which the spinal nerves, constituting the nervous supply of the body, are given off from the cord, we find that each nerve

(Fig. 14, *S.N.*) is connected to the cord by two roots. One of these roots (*A.R.*), leaving the *front* portion of the cord, is called the *anterior root*, the other, leaving the cord behind, is termed the *posterior root* (*P.R.*). The anterior or front root is smaller than its neighbour. The posterior root, in addition to its larger size, shows a *ganglion* (*ga*) or mass of nerve cells shortly after it leaves the cord. These two roots unite shortly after leaving the cord, and pass through a bony canal between the vertebræ or joints of the backbone. Passing out in this fashion, they are seen to divide again into two portions, the division of the front root being large, and that of the posterior of smaller size.

It may now be asked what is the exact meaning of the origin of the common nerves of the body given off from the spinal cord, each by a double root? The experiments of Sir Charles Bell showed that if the anterior (or front) root of a spinal nerve be divided, the posterior or hinder root being left intact, the animal *loses the power of movement* in the part supplied by the nerve in question, but retains sensation or feeling in the part. On the other hand, if the posterior root of a spinal nerve be divided, and the anterior or front root be left uninjured, the animal retains the power of movement in the parts supplied by the nerve, but *loses sensation* in these parts. By these experiments it was definitely ascertained that the nerve fibres passing out from the front of the spinal cord *convey messages to the muscles of the body*, and are, therefore, known as *motor fibres*. On the other hand, the nerve fibres, which are given off by the posterior or hinder roots, are seen to be those conveying messages *from the body to the spinal cord and brain*. As these latter fibres convey sensations, chiefly those of touch or feeling, they have been called *sensory fibres*.

We are now in a position to see more definitely than before how *reflex action* is carried out. In each nerve of the body, originating from the spinal cord, we thus find two sets of fibres included. One set (*front fibres*) carry messages from the cord to the body, the other set (*hinder fibres*) carry messages from the body to the cord or the brain as the case may be. Reflex action, we can thus understand, is carried out by a definite nervous mechanism. The impression made upon the foot of a sleeping man is thus carried by those fibres of the nerves supplying the part touched which enter the posterior root of the cord (*P.R.*), and carry the message to some centre or other in the cord. This last, in its turn, sends the reflected message outwards through the front fibres (*A.R.*) of the nerves supplying those muscles which move the foot away from the seat of irritation.

Spinal Centres.—From what has been said of the structure of the spinal cord we see that this great main line of the nervous system

is not to be regarded as a mere transmitter of messages, but that, having a due supply of nerve-cells in its grey matter, it can also act as a nerve centre. Physiologists recognise that in the spinal cord we have a series of such centres governing various actions. It is not necessary in the present instance to enter into detail regarding the nature of the spinal cord "centres," whose existence has thus been indicated, but it may be added that, at the upper part of the cord, important centres exist for regulating the action of the heart, the movements of breathing, and certain actions of the eyes connected with the movements of the pupils. Lower down in the cord we find centres devoted to the regulation of the movements of the bowels, bladder, and other organs. It would appear also that, in so far as the work of the spinal cord is concerned, many actions which

we may regard as ordinarily performed by the brain may be habitually, or on occasion, controlled by the cord itself. If a frog be decapitated, and a drop of vinegar or mustard be applied to the web of the hind foot, the headless animal will use every endeavour to wipe off the irritating substance. Here, in the case of a lower animal at least, we see the spinal cord performing actions which, in the case of a normal frog, we should regard as being carried out by the brain itself. It may be that in higher animals the brain assumes

an importance unknown in lower life, but it is a reasonable view of the physiology of the nervous system, which assumes that the spinal cord is capable in many instances of acting as an efficient deputy to the brain. The fact that the spinal cord possesses such functions enables us more clearly to understand the reason why, in disease-conditions affecting the cord, serious results are capable of being produced.

The Brain.—Contained within the cavity of the skull we find the brain (Figs. 16 and 17). It may be interesting to note at the outset that in the development of the brain of man we find that organ, in proceeding from its earlier to its more perfect stages, exhibits a series of phases, each of which may be said to represent the permanent condition of the brain in lower forms of backboned animals. In its earlier stage the brain of man corresponds to the perfect condition

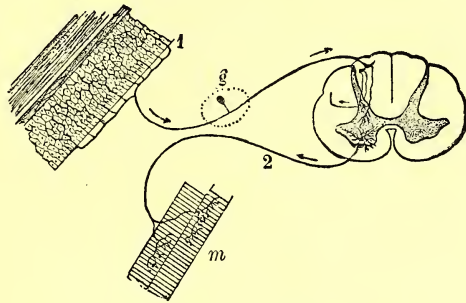


FIG. 15.—Scheme of a Reflex Action.

- 1, The Sensory or Afferent Nerve; 2, the Motor or Efferent Nerve. The former passes from the Skin to the Spinal Cord (entering the Cord by the Hinder Root of the Nerve); the latter passes from the Cord to the Muscle *m*, leaving by the Front Root.

seen in the lowest fishes. Later on it approaches the character of the brain of the reptile. In its further development it resembles the brain of the bird or lower quadruped, whilst finally it attains to its own rank, representing the highest in the animal world.

The brain itself may be said to exhibit five divisions. These, beginning in order with the lowest portion, or that next the spinal cord, are represented first by the *medulla oblongata* (Fig. 19, 34). The second portion of the brain is represented by the *cerebellum* or "lesser brain" (Fig. 18, *l, l*, and 17, *e*). The third division we may regard as consisting of the *Pons Varolii* and *optic lobes* (Fig. 18, *h*).

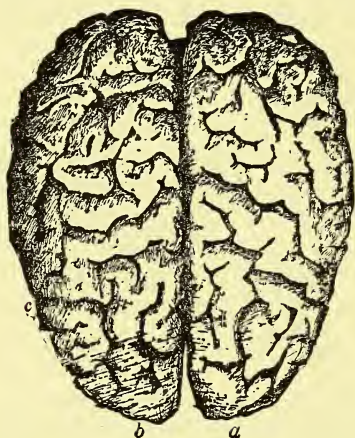


FIG. 16.—Brain viewed from above.
a and *b* represent the front of the two lobes or halves of the cerebrum.

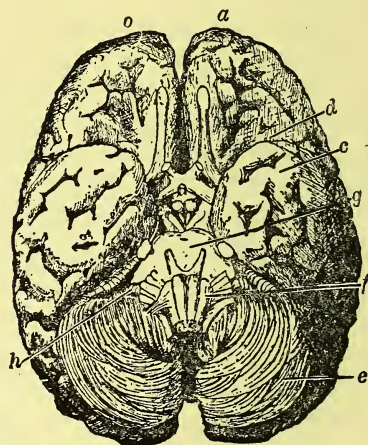


FIG. 17.—Brain viewed from below.
o, Front of Cerebrum; *d*, Fissure; *c*, a Brain Lobe; *g*, Pons Varolii; *f*, Medulla; *e*, Cerebellum; *h*, Cut Ends of Nerves.

The fourth division represents what are known as the *basal* or *central ganglia*, consisting of the *corpus striatum* and *optic thalamus* (*e, g*); whilst the fifth, and highest division of all, is represented by the *cerebellum* or "great brain" (*a, d*), consisting of its *two lobes* or *hemispheres*.

It will thus be seen that the brain, so far from being a single organ, is composed of a definite number of parts, each part discharging a distinct duty in the work of governing the body. The principle of "the division of labour" is again typically represented in the brain, so that we gain the idea that, in the brain, as in other parts of the body, the duties discharged are of very varying importance. This view of matters, bringing before our minds the different functions discharged by different parts of the brain, is essential for our understanding of the manner in which the central organ

of the nervous system discharges its duties. The brain is covered by membranes, which correspond to those which we have already seen invest the spinal cord, so that it is amply protected against the effects of ordinary shock or injury.

The Medulla Oblongata.—Dealing first in order with what may be called the lower section of the brain we find the *medulla* (Figs. 17 *f*, and 19, 34) to constitute the connecting link between the brain above and the spinal cord below. This portion of the brain becomes broader as it rises from the cord, and its interior forms a cavity known as the *fourth ventricle* (Fig. 18, 4), in which the central canal of the spinal cord ends. An interesting feature connected with the “medulla” is that in its lower part the nerve fibres, passing from the brain on each side, cross to the opposite side of the spinal cord. This feature is of extreme interest, inasmuch as it teaches us the reason why an injury on one side of the brain is seen to affect the other side of the body. A person stricken with apoplexy on the right side will be found to have the injury or lesion on the left side of the brain, and *vice versa*.

The medulla, although unconnected with any of the higher operations of mind, is an extremely important part of the brain through its particular position in the nervous system. Through it run the nerve fibres passing from the brain to the body; whilst its nerve cells give origin to certain important nerves governing the heart, breathing, swallowing, and movements of blood-vessels. Whilst injuries to more important parts of the brain, important that is as regards intellectual action, may be recovered from, even a slight injury to the medulla may be productive of fatal results. A blow on the back of the neck will thus have the effect of arresting the heart's action, breathing, and other vital processes, whereas it is well known that a person may lose a considerable amount of brain substance belonging to the cerebrum or great brain (Fig. 16) without necessarily exhibiting any very serious or lasting effects.

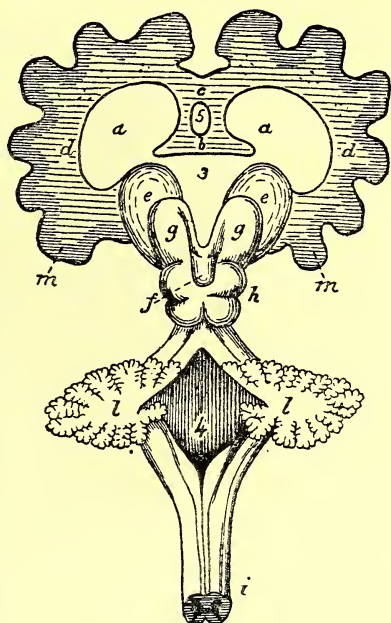


FIG. 18.—Ground Plan of Brain in Sections, viewed from above.

a, a, Lateral Ventricles; b, Lamina Terminales; d, White Matter; m (dark shading), Grey Matter; c, e, Corpora Striata; g, g, Optic Thalami; f, Pineal Gland; h, Corpora Quadrigemina, or Optic Lobes; l, l, Cerebellum; i, Spinal Cord; 3, Third Ventricle; 4, Fourth Ventricle.

The Cerebellum.—Lying above the medulla just described we find a band-like structure known as the *Pons Varolii* (Fig. 19, 33). This consists of nerve fibres, and connects the cerebrum (or great brain) with the cerebellum and the medulla. Above it are two white masses, which pass upwards to the under surface of the cerebrum. These masses are known as the *Crura cerebri*. They carry the nerve

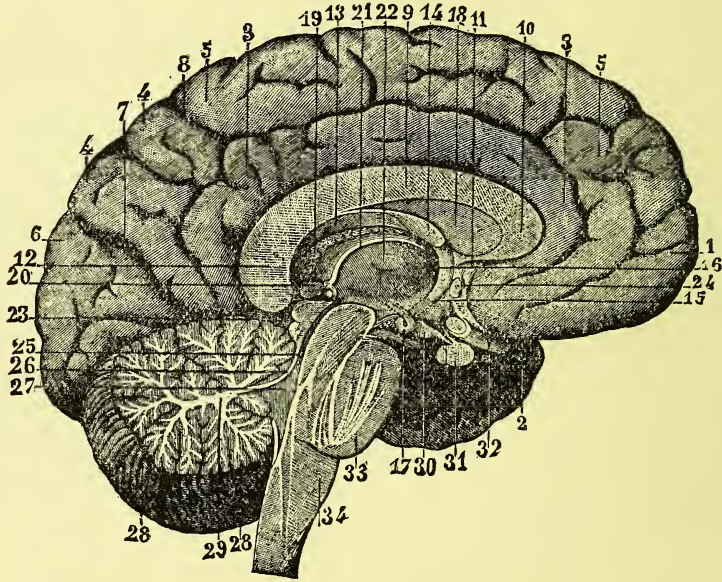


FIG. 19.—Inner Face of Left Brain (Section).

- 1, Hemisphere showing Frontal Lobe; 2, Sphenoidal Lobe; 3, Frontal Convulsions, Inferior and Internal; 4, Parietal Lobe; 5, Internal Superior Frontal Convolution; 6, Occipital Lobe; 7, Fissure separating Parietal Lobe; 8, Calloso-marginal Fissure; 9, Section of Corpus Callosum; 10, Knee of Corpus Callosum; 11, Front of Corpus Callosum; 12, its Hinder Margin; 13, 14, 15, Trigone; 16, Foramen of Monro; 17, Mammillary Process; 18, Septum Lusidum; 19, Velum Interpositum and Choroid Plexus; 20, 21, Pineal Gland; 22, Grey Commissure of Ventricle; 23, Corpora Quadrigemina; 24, Anterior Commissure; 25, Aqueduct of Sylvius; 26, Valve of Vieussens; 27, Ventricle of Cerebellum; 28, Section of Cerebellum; 29, "Tree of Life" appearance of Cerebellum; 30, Section of Tuber Cinerium; 31, Pituitary Body; 32, Optic Nerve; 33, Pons Varolii; 34, Section of Medulla Oblongata.

fibres from the medulla into the cerebrum itself. The "*Pons Varolii*" may be regarded, as its name indicates, as a bridge connecting the medulla, not merely with the cerebrum, but with the cerebellum also (Fig. 17, e, and 19, 28). The cerebellum, or "lesser brain," forms one of the two prominent divisions of the brain when the brain is regarded externally. It lies below the great brain itself, and is found behind and above the medulla and the *Pons Varolii* already described. It is composed of two parts called hemispheres,

connected by an isthmus called the *vermiform process*. On each side the cerebellum is connected with the cerebrum, the Pons Varolii, and the medulla. Viewed from the outside the cerebellum is seen to exhibit a series of furrows, as if it consisted of a number of leaves of a book closely placed together. When a section is made of the cerebellum (Fig. 19, 28) we find grey matter to exist towards the outside and white matter in the interior, the appearance of the two kinds of nerve tissue giving a tree-like aspect, to which the name of *arbor vitæ* (29) has been applied.

The Central Ganglia.—What are known as the *basal or central ganglia* consist of two masses known respectively as the *corpus striatum* and *optic thalamus* (Fig. 18, e, g). If we make a longitudinal section of the brain we see that these latter masses, existing in the base of the brain, practically lie between the body on the one hand and the cerebrum (or great brain) on the other. Their position is significant of their functions. In front we find the *corpus striatum*, while behind it lies the *optic thalamus*. Each consists of grey and white matter, in other words, they contain nerve cells and nerve fibres. Their functions will be considered when we deal with the duties discharged by different parts of the brain, considered as a whole.

The Cerebrum.—The *cerebrum*, or “great brain” (Figs. 16 and 17), occupies by far the largest part of the cranial or skull cavity. It is almost completely divided into two halves or *lobes* (Fig. 16), also known as *hemispheres*. Below the surface of the two *lobes*, separated by the longitudinal fissure, we find a connecting band of fibres known as the *corpus callosum* (Fig. 19, 9). This band serves to convey the nerve fibres from one lobe or half of the cerebrum to the other. Viewed externally, the surface of the cerebrum is seen to be thrown into a complicated series of folds or *convolutions* (Fig. 20). These convolutions are constant in respect of their size and position, but it is generally admitted that in the more civilised races of mankind, and in the more highly cultured

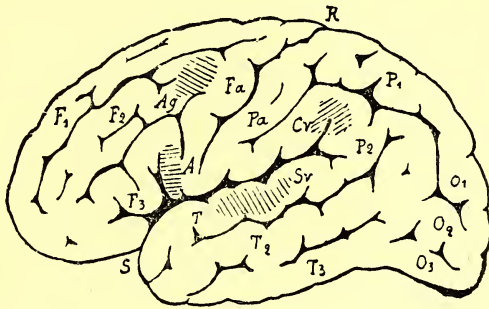


FIG. 20.—Left Lobe of Cerebrum from the side.

F₁, F₂, F₃, Frontal Convolutions; Fa, Frontal Ascending Convolution; Pa, Parietal Ascending; P₁, P₂, Parietal Convolutions; T₁, T₂, Temporal Convolutions; O₁, O₂, O₃, Occipital Convolutions; R, Fissure of Rolando; S, Fissure of Sylvius; A, Speech Centre; Cv, Writing Centre; Sv, Centres affected in word blindness and word deafness.

individuals of civilised races they are deeper and more complex than in less civilised races and less cultured individuals. The cerebrum externally is seen to be divided into certain regions or areas by what are known as "fissures." The first of these is called the *fissure of Rolando* (Fig. 20, *R*). It runs from the upper part and middle of the brain on each side downwards and forwards. Another important fissure is known as the *fissure of Sylvius* (*S*). This fissure practically divides the middle of the brain from the front portion, beginning below and passing in an oblique direction on the outer surface. Another fissure, known as the *parieto-occipital fissure* (Fig. 21, *P.O.F.*), lies at the back of the brain. This division is better marked on the inner surface of each half or hemisphere than on the outside.

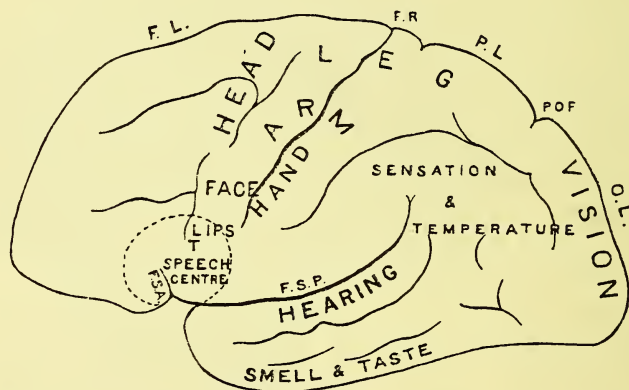


FIG. 21.—Left Lobe of Cerebrum from the side showing Brain Centres. The front of the Lobe lies to the left hand side of drawing. *F.L.*, Frontal Lobe; *F.R.*, Fissure of Rolando; *P.L.*, Parietal Lobe; *F.S.P.*, Fissure of Sylvius; *P.O.F.*, Parieto-Occipital Fissure; *O.L.*, Occipital Lobe.

Brain Lobes.—Externally, the brain has been divided by anatomists into *lobes* (Fig. 21) corresponding roughly with the bones of the skull (see vol. ii.) which invests them. We thus distinguish the *frontal lobe* (*F.L.*), which forms the front part of each hemisphere of the cerebrum. To this succeeds the *parietal lobe* (*P.L.*), which forms the middle part of each half of the cerebrum, being defined in front by the fissure of Rolando, and below by the fissure of Sylvius. The *occipital lobe* (*O.L.*) corresponds practically to the hinder part of the cerebrum resting on the occipital bone. Another lobe is known as the *temporo-sphenoidal*, this portion resting on the temporal bone. What is known as the *central lobe*, or *Island of Reil*, is the name given to certain convolutions lying imbedded in the fissure of Sylvius.

The Build of the Brain.—With regard to the general structure of the brain, a section made through the cerebrum (Fig. 18, *d*) shows that the grey matter, consisting of nerve cells (*m*), occupies the external surface of its convolutions or folds (Fig. 16), the white matter being situated internally. The arrangement of nerve cells and fibres in the cerebrum therefore follows exactly the opposite arrangement to that seen in the spinal cord. There we noted the grey matter to be situated internally, the white matter, consisting of nerve fibres, to exist in the outer layers. Brain cells thus existing in the surface of the cerebrum number many millions, and as the grey matter dips down into the folds we thus note that the convolutions of the brain enormously increase the number of brain cells which exist. With regard to the internal constitution of the brain, we find that it is not a solid structure. It possesses certain hollows which remain as the result of its mode of development. The chief of these are known as the *lateral ventricles* (Fig. 18, *a*, *a*). These are found inside the cerebrum, and when the fluid they contain increases abnormally in quantity they constitute the disease popularly known as “water in the head.” What is known as the *third ventricle* (3) is found near the base of the brain, this latter cavity communicating with the *fourth ventricle* (4), which we have seen to exist at the top of the spinal cord.

Brain Weight.—In man the brain averages in weight about forty-nine ounces, in women the average weight being forty-four ounces. After the age of forty or forty-five years the brain diminishes in weight, the rate of diminution being generally held to be about one ounce for every ten years of life. Great brain weights are occasionally met with, and in the case of many distinguished men the brain has been found to present a weight of one pound, or more, over the average. At the same time it should be noted that the brains of obscure and uneducated individuals may occasionally exhibit a similar increase of weight. When we have regard to the fact that the weight of the brain includes a vast amount of white matter consisting of nerve fibres which have no concern with intellectual actions, we may note that brain weight, by itself, constitutes no evidence of intellectual ability. That condition, which probably operates most powerfully in the production of intellectuality, is represented by inheritance or heredity, combined, no doubt, with the effects of education. The phrase “Big brain, little wit” is probably quite as true as that which asserts that a large brain is invariably associated with superior intellectual attainments.

Brain Functions.—The functions of the *medulla* have already been definitely indicated. It is, intellectually considered, a low

section of the brain, whose duties, important enough in their way, are limited to the regulation of the processes of life, which, as we have seen, include the regulation of the heart, lungs, and other organs. With regard to the *cerebellum*, this part of the brain may be regarded as representing the work of a coachman, in that it harmonises or "co-ordinates" muscular actions. In other words, the duty of the cerebellum is that of bringing into harmonious action different groups of muscles. It is to the cerebellum, for example, that we owe our power of walking straightly, or swimming properly. Destruction of the cerebellum in a bird does not render the animal incapable of flying, but causes the movements of the wings to be of an erratic character. Disease of the cerebellum is thus frequently associated with erratic movements on the part of the subjects of such disorders. It must be clearly understood here that the cerebellum is not responsible for the control of muscular movements, any more than a coachman gives the horses under his control the power of drawing the carriage. It merely acts in the position of the coachman who controls and harmonises the movements of the animals.

The Central Ganglia.—These two masses (Fig. 18, *e, g*) we have seen to be practically placed between the upper brain and the body. The *corpus striatum* is regarded as the centre through which messages, passing to the body from the cerebrum, or great brain, are modified in their passage, and in all probability allocated to their particular termini. It is thus a kind of brain "clearing-house."

The *optic thalamus*, on the other hand, may be described as sitting "at the receipt of custom." In other words, it is a receiving-house, and deals with messages coming from the body and modifies them, so that they may suitably reach the cerebrum. These two masses together may be said to constitute our "private secretaries," and there can be little doubt that on occasion they act as deputies of the higher brain. Many so-called "automatic" brain actions are carried out through the operation of these centres. We may even conceive that, when the higher brain is, so to speak, switched off, as in sleep, from the ordinary control of life, the "central ganglia" may act in regulating our unconscious existence. *Sleep-walking*, or *somnambulism*, may thus be regarded as a result of the "central ganglia" taking upon themselves the duty of regulating an unconscious phase of life. There is little doubt also, that the condition known as *hypnotism* or *mesmerism* is also due to the switching off, by one means or another, of the action of the cerebrum, and to the consequent automatic operation of the central ganglia. In this way is demonstrated the relative independence of various parts of the brain.

Probably, also, the phenomena of dreaming may be regarded as largely depending upon the action of the central ganglia. Even if the higher centres of the cerebrum may be regarded as concerned in the production of dreams, the central ganglia may nevertheless carry out the dream itself, and more especially where the phenomena of sleep-walking have to be taken into consideration.

The Functions of the Cerebrum or Great Brain.—Recent researches have made us familiar with the functions of the cerebrum. If we divide each lobe of the cerebrum into three portions (Fig. 21), namely, a *frontal* or forehead part, a *parietal* or middle portion, and an *occipital* or hinder portion, we discover that the pre-frontal or foremost portion is that concerned with the highest operations of the mind. The middle portion of the brain is devoted to the regulation of muscular actions; groups of brain cells having been demonstrated to exercise command over the various muscles of the body. The hinder portion of the brain, on each side, may be regarded as exercising the function of receiving impressions from the organs of sense. Hence, whilst in the front portion of the brain we find the *intellectual centres* in the middle portion, we discover *motor centres*, or those regulating movements, and, in the hinder portion, *sensory centres*, connected with the reception of messages, from the organs of sense. The centre for sight, for instance, is found in the hinder or “occipital” lobe of the brain. Centres for messages conveyed from the ear are situated near the ear itself in the part known as the temporal lobe, whilst sensations of touch and of temperature (or the heat sense) are located in the hinder part of the parietal or side lobe (see Fig. 21).

Aphasia.—One interesting proof of the correctness of what has been termed *localisation of brain function* is found in the case of a certain affection known as *aphasia*. (See also section on “Brain Diseases,” p. 31.) This ailment, which may be denominated loss of the power of speech, is not caused by paralysis of the muscles concerned in speech, but is due to destruction of what is known as the *speech centre* in the brain. In a typical case of this kind the individual can neither speak nor write, yet he understands perfectly what is said to him. After death in such a case a certain centre on the *left side* of the brain in front (Fig. 21) is found to be destroyed. A similar speech centre exists on the right side, but as the left half of the brain controls the movements of the right side of the body and is of course the predominant half, we find the right speech centre to be, in ordinary individuals, largely in abeyance. Occasionally it happens that a person who has suffered destruction of his left speech centre, slowly recovers the power of speech. In such

a case we assume, on *post-mortem* evidence, that the right speech centre has taken upon itself the functions of the disordered left centre. Here we have an illustration of how exactly science has localised a particular function of the brain. An interesting observation has also been made to the effect that, whilst an individual suffering from *aphasia* has been unable to write or speak English, he has been capable of exercising both functions in the case of a foreign language with which he has been acquainted. The explanation of this curious fact is found in the consideration that different groups of brain cells are devoted to different branches of intellectual work. If we therefore suppose that the individual in question has had the brain cells connected with the exercise of his native language destroyed, those cells devoted to the exercise of the foreign language must have escaped disaster.

Phrenology.—With reference to the system of brain localisation, known in former years as “Phrenology,” it may be said that no reliance can be placed on this view of regarding the brain and its functions. There are no “organs” in the brain corresponding to the divisions or areas marked by phrenologists on the skull. This system, besides, does not take account of many collections of nerve cells and convolutions which exist on the base and other parts of the brain, and which are, therefore, hidden from any superficial examination of its surface.

SECTION II

DISEASES OF THE BRAIN AND NERVOUS SYSTEM

As the *anatomy* of the nervous system has been fully considered in the previous section, it will be taken for granted that this has already been the subject of study, and it only remains to point out that problems presented by morbid processes situated in this system are the most difficult of solution of all those placed before the physician, because the nervous system does its work *silently*. There are no *murmurs* as in heart diseases, no *crepitations* as in some lung troubles, no means of *palpating* or of feeling the diseased area as in abdominal diseases; and further, there are no *secretions* which can be submitted to chemical tests, the physician having to depend entirely upon the *symptoms* placed before him, and then, with the aid of anatomy and physiology, to determine the point at which disturbance would produce the said symptoms. The position is rendered more difficult, too, by the fact that our knowledge of the functions of the

various portions of the nervous system is still very limited, most advance having been made in the investigation of the *motor areas* and paths—that is to say, the regions of the system concerned in the originating and conveying of impulses to the *muscles* which induce them to *contract*; and this is fortunate, because any abnormality in the contractility of a muscle or group of muscles can be readily demonstrated. Thus it is easy to see that a muscle is *paralysed*, the difficulty arising when it has to be decided where the disease lies which caused the paralysis, but the researches in anatomy and physiology have rendered this task comparatively easy. Diseases involving the *sensory apparatus*, that is to say that concerned in conveying sensory impulses of various kinds from peripheral points in the body to the centre in the brain, are much more difficult to elucidate because of the fact, already mentioned, that our knowledge is still very limited. Lastly, the reader must bear in mind that there are very few diseases indeed in which only *one portion* of the nervous system is involved. Thus diseases of the *brain* frequently involve the *spinal cord* and *vice versá*, and affections of the *nerves* may have a *local origin*, or their cause may be situated in the *cord*, or they may indeed be due to processes outside the nervous system altogether. A case of *paralysis* of the lower limbs may be due to inflammation of the spinal cord, but it has been found to be due to the irritation set up by *round worms* in the intestine. From these few remarks on the *difficulties* of *diagnosis* in nervous complaints we pass to a consideration of the diseases themselves.

Simple Meningitis, or Inflammation of the Membranes of the Brain, is an acute disease due to various *causes*, injuries to the head being the most frequent; and it must be borne in mind that the initial injury may be apparently very slight, so slight indeed that no notice is taken of it at the time of the accident, and this mistake is most likely to be made when the patient has been intoxicated at the time of its receipt. Meningitis may result from exposure of the unprotected head to the excessive heat of the sun. The inflammation may spread from the diseased condition of a neighbouring bone, such as that of the *temporal bone*, which sometimes arises from *suppuration of the ear*. Lastly, meningitis may be a *complication* of other acute diseases, such as erysipelas, pneumonia, or general blood-poisoning. The onset of the disease is as a rule sudden, a shivering fit ushering in the complaint when the patient is an adult, and convulsions in the case of a child.

Symptoms.—The most marked of these is an agonising *head-ache*. The temperature rapidly rises to 104° F. The patient is irritable and objects to bright light, or to noises. He may vomit.

The neck becomes rigid and retracted, so that the head is bored into the pillow. *Sleeplessness* is accompanied by *delirium*. In the later stages the patient passes into a condition of *stupor*, different regions of the body become *paralysed*, the stupor passes into *coma*, and the patient dies.

Treatment.—Drugs have no effect in controlling the inflammation, the only hope lying in the possibility of the surgeon being able to make an outlet for the matter which accumulates on the surface of the brain, and this is often the case when the affection is secondary to suppuration in the *ear*. Apart from surgical interference, all that can be done is to place the patient in a cool, dark, well-ventilated room. To shave the head and apply *ice* in the form of ice-bags to it. As constipation is present as a rule, a few grains of *calomel*, followed by a saline purge, may be administered with beneficial effect at the commencement of the trouble. To allay the irritability and induce sleep, sedatives such as bromide of potash in 10 or 15 grain doses may be administered, as may also be *morphine* hypodermically in doses varying from $\frac{1}{12}$ th to $\frac{1}{8}$ th of a grain.

Tubercular Meningitis, or Water on the Brain.—This disease is an *acute tuberculosis* which attacks the membranes of the brain, and more especially those at the *base of the brain*. Small nodules of tubercle appear on the membranes and on the outer surfaces of the arteries, and the surface of the brain is covered with a turbid exudation, the result of the inflammation. The disease attacks *children* much more frequently than adults, and is met with most commonly between the ages of two and five years.

Symptoms.—The disease commences *insidiously* in children. For some weeks the health appears to be failing, the child grows irritable, and its character changes. It refuses to play with its companions, preferring to sit about alone. It loses its appetite and grows thinner. Frequently the first distinctive symptom of the disease is a *convulsion*, and this is followed by *vomiting* which has no relationship to meal times, severe *headache*, and a rise in the *temperature*. The child often emits a short, sharp cry termed the *hydrocephalic* cry. Constipation is a marked and persistent symptom. The *pupils* are irregular, and one is larger than the other. The *pulse* is irregular and slow. This, which is termed the *irritative* stage, is succeeded by one in which the signs of irritation subside. The child becomes dull and apathetic. A *squint* is often developed. The walls of the *abdomen*, instead of bulging out to some extent, are retracted, producing what is termed the *boat-shaped* abdomen. If the finger nail is drawn across the skin a red line appears and remains for some considerable time; this is called the *tache cerebrale*. The child

frequently *grinds its teeth*. A third and final stage is reached in which the child becomes *comatose* and can no longer be roused. Occasionally, however, during the last forty-eight hours of the illness it happens that consciousness returns for a little while, and the child sits up and takes an intelligent interest in its surroundings and is apparently much better, but to the great distress of its parents it soon again relapses into the condition of coma, which persists to the end. *Convulsions* are common during this stage, and the limbs may be paralysed. Before death the pulse becomes very rapid, and the constipation is replaced by diarrhoea. The temperature frequently falls to below normal. The disease generally runs its course in about twelve days, and once it has commenced there is no known measure of staying it. The management of a case would be carried out on similar lines to that of simple meningitis.

Apoplexy.—This is a term meaning sudden loss of consciousness and power of movement, applied to a train of symptoms which arise from *hæmorrhage into the brain*, though practically the same symptoms may arise from sudden *anæmia* of the brain, due to the blocking of a blood-vessel by a clot or fragment of fibrin carried to it in the blood stream from a diseased valve of the heart (*embolism*), or from a coagulation of blood in the vessels of the brain (*thrombosis*). Hæmorrhage into the brain is generally due to a weakened condition of the walls of the artery due to *arterio-sclerosis*, such as is found in chronic Bright's disease of the kidneys, plus a *hypertrophied* and consequently over-powerfully acting *heart*, plus some undue exertion or *strain*, these three factors resulting in the rupture of a blood-vessel and the pouring out of blood either on to the surface or into the substance of the brain. The *effects* of the bleeding are to *compress* the brain, or to tear its substance, while the blood acts as an *irritant* and sets up inflammatory changes in the brain. Hæmorrhage is more common in people passed middle life, whilst embolism is more frequently met with in young people who are the subjects of some heart complaint. The *symptoms* of hæmorrhage depend upon the *amount* of blood poured out and the *rate* at which it escapes from the torn artery, and also upon the locality in the brain of the bleeding. When a large quantity of blood is suddenly extravasated symptoms constituting the true *apoplectic stroke* result. The patient suddenly falls to the floor unconscious and powerless, the face is flushed, the lips livid, the breathing is *stertorous*, and a snoring sound is produced; the eyeballs are fixed, and the pupils are as a rule *dilated* and insensible to light; the *pulse* is full, hard, and slow. The limbs are quite inert and fall limply to the ground if lifted, but one side is more inert than the other, and the cheek of one side is

flaccid and is puffed out during expiration; these last symptoms indicating one of the most important results of the hæmorrhage, namely, *hemiplegia* or *paralysis* of the face, arm, and leg of one side of the body, the side affected being the *opposite* to that of the brain in which the bleeding has taken place. Death may result from such an attack in a few minutes or a few hours. Should the patient survive the initial shock, the temperature begins to rise during the first forty-eight hours, a result of the irritation and inflammation set up by the clot. Every attack, however, is not necessarily as severe as the one described. If the bleeding comes on *gradually*, unconsciousness and coma may not supervene till some time after the power of movement has been lost. Or, again, when a small hæmorrhage occurs near the surface of the brain there may be only loss of power confined perhaps to the side of the face, or to one leg or arm, and unaccompanied by loss of consciousness. Occasionally there are premonitory symptoms such as giddiness, headache, confusion of the mind, and numbness in the extremities; these are the result of *congestion* of the brain, and immediately precede the actual "stroke." In the event of the hæmorrhage being comparatively slight, the consciousness gradually returns, and on the third or fourth day the temperature falls. Only the *paralysis* now remains, and as to how long it will last and to what extent it will remain permanent, will depend upon the extent of the injury inflicted on the brain; it may all disappear in the course of a few days or weeks. This, however, is exceptional; and though the patient may again move about, he generally drags the affected foot, or has some weakness of the hand, or the *speech* is affected. Mentally he is never quite the same again, some impairment of judgment or weakening of the memory always remaining, and very slight exertion is apt to bring about a renewal of the attack. Hæmorrhage into the brain may very easily be mistaken for *concussion of the brain*, the result of a blow or fall on the head; for *opium* poisoning, where, however, the pupils are *always* contracted, whilst this is only rarely the case in apoplexy. It may also be mistaken for *alcoholic* poisoning, where the odour of alcohol might help to a right decision were it not for the fact that hæmorrhage often occurs during the course of a drinking bout; and it may be confused with *uræmic* poisoning and with the *coma* which follows an *epileptic fit*. The following may be mentioned as symptoms of serious import after a bleeding into the brain: the unconsciousness being very deep and lasting for a long time, great irregularity of the *breathing*, the *temperature* rising very high after the first few days, and the formation of *bedsores*.

Treatment.—If practicable, the patient should not be carried.

any distance from the spot where he fell, but placed carefully and gently on a mattress on the floor. He should be kept absolutely quiet, lying on his back with the head raised. Should there be much difficulty in breathing, he may be turned on to his side. Care must be taken that the chin does not fall forward on to the chest. Cold in the form of an ice-cap should be applied to the head, and the feet should be kept warm; but as the patient is unconscious, the hot bottles must not be too hot and must be wrapped in flannel, otherwise a serious burn may result. The bed should be kept smooth and free from crumbs, and every care taken to avert the formation of *bedsores*. If the pulse is hard and bounding, and the patient has been strong and of good constitution, *blood-letting* relieves the blood pressure in the brain and allays the bleeding. The same object may be obtained by promoting free evacuations of the bowels, placing 5 to 10 grains of *calomel* on the tongue being a simple way of administering a purgative; or, instead of the calomel, 1 or 2 drops of *croton oil* mixed with a few drops of glycerine may be placed at the back of the tongue. No attempt should be made to *feed* the patient in the ordinary acceptance of the term; small quantities of meat extracts or milk may be tried, but if there is any difficulty in swallowing, feeding by the bowel should be resorted to. Under all circumstances *stimulants* are to be avoided. When all symptoms of irritation have passed off, gentle rubbing of the paralysed limbs may be resorted to, but this is not to be commenced earlier than *ten days* after the attack. After a month has elapsed massage and *faradic*, or the interrupted electric current, may be tried, and *tonics* such as strychnine and iron administered.

Aphasia.—Loss of speech, to a greater or lesser extent, is one of the symptoms which follows bleeding or embolism in the *left* side of the brain (see page 25), and this loss or impairment does not mean the mere difficulty of speaking attendant on the paralysis of the side of the face, but is the result of much more complex changes. Speech, for its normal production, needs two sets of mechanisms in the brain—one a *sensory* or receptive mechanism, to receive impressions, and a second, a *motor* or emissive mechanism, by which expression can be given to the ideas in the brain either by speaking or writing. The sensory mechanism consists of the *eyes* and the *ears*. These convey impressions of light and sound to the centres for *seeing* and *hearing* in the brain. From these two centres impressions are conveyed to two groups of cells in the brain, termed the *word seeing* and *word hearing* centres, and these again are in communication with the centre for *intelligence*. The intelligence centre is in constant and close communication with the *will* centre, where are originated all the *movements* necessary to produce speech or writing;

and there are also special groups of cells which constitute the centre for *speech* and the centre for *writing*. These each control two centres—the *co-ordinating speech* centre and the *motor speech* centre, and the *co-ordinating writing* centre and the *motor writing* centre; and the harmonious working of the whole mechanism, starting from the eyes and ears, ends in *speech* and *writing*. It will be at once seen that interference at any point will cause serious disturbance throughout the whole system. Thus if the *word hearing* centre on the sensory side of the chain is destroyed, the individual is *dumb*, because he cannot hear. Such a person may be able to read and to speak, but *spoken* words convey no meaning to him. The condition is well illustrated in the person born deaf, who is also dumb—a deaf mute. Or again, the lesion may involve the *word seeing* centre, in which case printed or written matter would not be intelligible to the patient, though he might be able to understand spoken words. Affections of speech due to changes in the sensory centres are termed *amnesic aphasia*. On the *motor* side of the system, whilst the patient can hear and see perfectly well, he has lost the *power* of speaking; the centre for speech having been destroyed, the intelligence has no mechanism by which it can carry out its wishes. Such cases are termed *ataxic aphasia*; the patient is quite intelligent, understands all that he sees or hears, but is unable to communicate his thoughts by speaking: he may or may not be able to *write* them. The fact will be grasped at once, that the affections of speech must vary greatly in each case, according to the extent of the injury and the number of *centres* involved. One patient cannot remember the names of things, or calls them by a different name; like the lady who went into a hardware shop and asked for a leg of mutton, and could not say what she really wanted. Others can talk and write, but cannot name an article held up to them. Others, again, retain one or two words, which they use in answer to every question and on every occasion; such as the man who said *tan tan* and nothing else for twenty years. When the affection causes a loss of the power of *writing* it is termed *agraphia*. The chances of recovering the power of speech are small in an adult. He may recover it to some extent, but is very apt to use wrong words. In children the chances are much better, and they often recover the power of speech; this happy result being probably due to educating the centres on the *right* side of the brain, which had lain dormant whilst the left side was doing the work.

The *only treatment* is to try and *educate* the person again, and, as might be expected, the chances of success are better in the case of children than in adult cases.

Tumours of the Brain.—A great variety of tumours are found in the brain. They may start in the bones of the skull and press inwards on to the brain, or they may have their starting point in the covering membranes, or lastly, they may commence in the brain substance itself. They comprise *gummata*, or syphilitic growths; *tubercular* masses; *cancerous* and *fibrous* tumours and *cysts*, which form in the brain as the result of a hæmorrhage. The presence of tumour results in *pressure* on the brain substance, in *irritation* of the brain, and in *paralysis*. The most prominent *symptoms* are—*headache*, which may be persistent or come in paroxysms, but which is always excruciating; *vomiting*, which is irregular and independent of meals; and changes in the optic nerves, termed *optic neuritis*. There is, as a rule, some mental disturbance—a sluggishness of the intellect, and a tendency to become emotional and silly. *Giddiness* is frequently present, and dimness of vision passing to blindness. Convulsive seizures are frequent, and eventually the patient passes into a state of *coma* and dies.

Treatment medicinally.—The only cases which can be benefited are those of *syphilitic* origin, and in these the administration of *iodide of potassium* and *mercury* has been followed by brilliant results. For the headache, cold applications in the form of the ice-bag are the most soothing; drugs seem to have no effect on it. *Surgical* interference has sometimes been successful, but there are not many tumours which come or lie within the reach of the surgeon's knife.

Chorea, or St. Vitus' Dance.—This is an acute nervous disease, consisting in irregular and involuntary contractions of the muscles of the face and limbs. It chiefly attacks children between five and fifteen years of age, and is more frequently met with in *girls* than in boys. Highly strung excitable girls, who have neurotic parents and whose *education is overstrained*, are specially liable to the disease. Chorea is closely associated with *rheumatism*, and murmurs in the heart produced by *endocarditis* are frequently met with; but beyond the fact that there is great *irritability* of the motor centres in the brain, and that *embolisms* in the cerebral arteries have been found in a considerable proportion of the cases, little is known as to what exactly constitutes the lesion.

Symptoms.—Attacks of the disease vary in their severity. In the *milder* cases there may be nothing more than restlessness and inability to sit still, some slight twitchings of the face, a tendency to involuntarily make grimaces and protrude the tongue. The irregular movements are exaggerated when the patient tries to perform some normal act, such as feeding herself, and sometimes the dropping of a plate or spoon at meal times first draws the attention of the parents

to the condition. The girl may complain of pains in the limbs, and is often emotional and subject to fits of crying, and irritability. In the *severe* cases, the movements are greatly exaggerated, so that the patient can neither feed nor dress herself. The irregular movements are constantly present, and the child is apt to hurt herself if not taken proper care of, and sores frequently develop, which may aid in the bringing about of a fatal termination. The most severe variety of the disease, which is accompanied by *maniacal* symptoms, generally attacks young women in the early months of pregnancy.

An attack of chorea generally lasts for two or three months, and ends, as a rule, in recovery; though some cases die from weakness produced by want of food and sleep, and also from the sores which have already been mentioned. The disease, however, is very apt to *recur*, more especially in the *spring* of the year.

Treatment.—As highly strung intelligent girls, the children of neurotic parents, are specially liable to the disease, such should be carefully watched during the *educative* period of their lives. All *overpressure* should be avoided; they should live quiet lives, free from excitement, and spend much of their time in the *open air*. The diet should be simple and nourishing. As *frights* are supposed to induce attacks, those in charge should be warned against the practice, common amongst nurses, of threatening children with bogies, &c., more especially at bedtime. For the attack itself *rest in bed*, together with simple diet, is of the first importance; the rest quiets the muscular irritability, and is at the same time good for the *heart*, should endocarditis be present. The child must be firmly but gently dealt with; and always does better when under the care of an experienced and well-trained *nurse* than under that of her immediate relations. Mental work, of course, must be entirely put aside. A *warm bath* should be given every day, and just before being removed from the bath a cold wet sponge should be quickly passed down the spine. As the condition improves, the child may be taken out into the fresh air, and recline on a sofa or hammock. Gentle massage of the limbs may be begun. Electrical treatment undoubtedly does well in some cases, and good results have followed the application of high frequency currents.

As regards drugs, arsenic, which acts both as a tonic and nerve sedative, is the drug to be first administered, and as children stand it well, it must be given in fairly large doses, beginning with 5 drops of Fowler's solution, in water, three times a day, after meals. The dose should be increased by a drop each day until 10 or 15 drops are being given three times a day. This dose should be given for a week or ten days, and then the dose should be again gradually in-

creased until the drug produces soreness and redness of the eyes, a sense of constriction in the throat, or vomiting, when it should be discontinued for a few days. If arsenic does not suit a patient, *valerianate of zinc*, 1 to 3 grains, with a grain or two of extract of hyoseyamus, made into a pill, may be given three times a day instead of the former drug. At night, 15 to 20 grains of bromide of potassium may be required to allay the irritability and procure sleep, and it is sometimes well to combine 5 or 10 grains of chloral with the bromide. In the severest cases it is sometimes necessary to administer inhalations of *chloroform*, not merely to give the patient some rest and sleep, but also to allow of food being administered. As the disease shows a marked tendency to recur during the spring, children who have suffered from one attack should be taken special care of during this season of the year, and all sources of excitement and mental strain avoided.

Epilepsy, or "Falling Sickness," is a disease of the nervous system characterised by sudden *loss of consciousness*, with or without *convulsions*. There are three varieties of the disease—(1) *Petit mal*, where there is simply loss of consciousness unaccompanied by convulsions; (2) *Grand mal*, in which the loss of consciousness is accompanied by general convulsions; and (3) *Jacksonian epilepsy*, where there is no loss of consciousness, and the convulsions are limited to a single region of the body, such as an arm or a leg, or one side of the face. As to the *cause* of the disease little is known about the lesion in the brain which gives rise to it in its typical form; the localised or Jacksonian variety is, however, due either to a tumour in the brain or to *injuries* to the skull, giving rise to pressure on the brain. By far the larger proportion of cases begin before the age of puberty, many begin in infancy, but between ten and fifteen is the commonest age during which the first attack shows itself. Females are, if anything, more prone to the disease than males. Whilst cases occur from time to time in the same families for generations, *heredity* does not seem to play a very important part in the production of the disease, though the members of families subject to other nervous troubles, such as *insanity* and *hysteria*, are certainly more liable to be attacked. The children of parents who are the subjects of *chronic alcoholism* run a great risk of developing into epileptics.

Symptoms.—1. *Petit mal*.—In this form of the disease the patient loses consciousness for a brief space of time but has no convulsions; thus he may be sitting at table and joining in the conversation, when suddenly he stops, in the middle of a sentence perhaps, drops anything which he may have been holding in his hand, and his eyes become fixed and his face pale. In a moment or

two the consciousness returns, and he goes on speaking again as if nothing had happened, and the only sensation he may have experienced was some slight giddiness. Sometimes the patient during the period of unconsciousness automatically performs some act, the most awkward being that of commencing to undress himself. Such attacks occur very frequently and gradually pass into the true epileptic attack.

2. *Grand mal*.—The true epileptic fit is frequently preceded by some peculiar sensation known as the *aura epileptica*, which warns the patient of an impending attack. The nature of the sensation varies in different cases; one may have numbness and tingling in the tips of the fingers, another may have an uneasy sensation in the stomach, whilst a third may see a flash of coloured light or hear a ringing in the ears. Immediately after the aura the patient may give a loud shout or scream, and then he falls to the ground as if shot and makes no effort at saving himself; in this way epileptics frequently injure themselves, and may be fatally burnt if they happen to be near a fire. The fit itself is divided into *three stages*. During the first, that of *tonic spasm*, the face is pale and the head drawn to one side, the jaws are fixed, the legs are stiff, the fingers are clinched, and the wrists and elbow-joints bent up. The chest muscles being also in a condition of spasmodic contraction, the chest becomes fixed, and thus the breathing is interfered with, and the face becomes livid. After lasting a few seconds this stage passes into the second, that of *clonic convulsions*, during which the spasms intermit, and the whole body is thrown into convulsions. The muscles of the face rapidly contract and relax, the eyelids open and close, the muscles of the jaws are similarly affected, and it is during this stage that the *tongue* is apt to be bitten. Frothy saliva, which may be blood-stained, flows from the mouth, but the lividity of the face diminishes, the chest not being so firmly fixed as during the first stage. The convulsions gradually subside, the limbs are relaxed, and the patient passes into the third stage, that of *torpor* or *coma*, during which he is quite unconscious and breathes heavily; after a while he may be wakened, but if left alone he may sleep for some hours and then awaken complaining of headache and some confusion of the mind. Sometimes a patient passes from one fit into another without any conscious intervals; this condition is termed the *status epilepticus*, and often terminates fatally.

In the third variety of epilepsy, termed *Jacksonian*, the patient does not lose consciousness, at least not during the earlier attacks, and the convulsions are confined to one region of the body. It is produced by injuries to the skull which result in irritation of the brain, or to the pressure of a tumour situated in the motor area of the brain. Jacksonian epilepsy may gradually pass into the typical

variety of the disease. It should be borne in mind that after a fit patients sometimes go about in a trance-like condition, and do things of which they have no recollection afterwards; many have been found guilty of assaults, and some have developed homicidal tendencies. A *hysterical* fit might be mistaken for a true epileptic one, but in the former case the patient takes care not to hurt herself when falling. She is never really unconscious; she cries out frequently whilst in the fit, the epileptic only at the beginning of the attack. She never bites her tongue nor injures herself in any way, and flings herself about in a manner quite different from that of the true epileptic.

Uræmic Convulsions might be mistaken for epilepsy, but there will probably have been some history of kidney disease, and the arteries will probably be found in a state of sclerosis. Though an epileptic fit rarely ends fatally, the outlook for the patient is always grave. There is no hope of curing old people, but an attempt may be made in the case of children. The chances of recovery are very small indeed where the attacks recur frequently, and when the mind is markedly affected. But whilst the large number of cases are practically incurable, some efforts must be made in the way of *treatment*, more especially in the case of children, in whom every source of irritation, such as adenoid growths at the back of the nose, foreign bodies in the ear, &c., should be removed. Moreover, the child should be treated with firmness as well as kindness, and his *education* should not be neglected, for epileptics are often capable of much good work, and are the better of some regular occupation. In adults the question of marriage frequently arises, and this should be prohibited, especially in the case of women. The *diet* of epileptics should be light and easily digestible. The meals should be served punctually at fixed times, and the stomach should never be overloaded. *Medicinally* many remedies have been tried and are still in favour, but the only ones that have any effect on the disease are the *bromides* of potassium, sodium, and ammonium. The sodium salt is probably the least irritating of the three, but the best results seem to follow the administration of all three in a combined dose. Some physicians advise giving the drug in divided doses through the day, that is from 10 to 20 grains dissolved in a large quantity of water, and preferably some *mineral* water three times a day after meals; whilst others seem to obtain better results by administering it in one large dose four or six hours before the usual time that an attack may be expected. Whichever plan is adopted it must be adhered to for a considerable time; some patients—in fact nearly all of them—take this drug all their lives, and it certainly should not be discontinued until the patient has been free from an attack for at least *two years*. The bromides

produce some distressing symptoms such as *drowsiness*, *dyspepsia*, and *heart* weakness. The dose should be diminished at such times or its mode of administration altered. They also give rise to ungainly pimples or *acne*, and for this *arsenic* in the form of Fowler's solution, beginning with two or three drops, should be combined with the dose of bromide. For the Jacksonian variety of epilepsy the aid of the surgeon has been called in, and sometimes with very happy results, more especially in cases in which, as the result of an accident, a bit of bone is pressing on the brain, and in which the pressure can be relieved by trepanning. The management of a patient during a fit has been considered elsewhere.

Hysteria.—This is a chronic disease of the nervous system in which the *intelligence* seems to have lost control over the *will* of the patient, *ideas* taking the place of the intelligence as the controlling influence of the body. It most frequently attacks women between the ages of fifteen and twenty-five, and is often associated with menstrual disorders, and ovarian irritation. The disease may begin suddenly after some severe *mental shock*, or a disappointment, with a *hysterical fit* which varies in its degrees of intensity, sometimes consisting merely in uncontrollable fits of crying and laughing, the attack almost invariably terminating in the patient voiding a large quantity of pale-coloured urine of low specific gravity; whilst at others the patient is suddenly thrown into wild convulsions, in which condition she shouts and screams, often uses foul language, and flings herself about, but takes care not to hurt herself. She is apparently quite unconscious, but close observation often reveals that she is all the time furtively watching the effects of her condition on the on-lookers. In a large number of cases, however, no fit occurs during the whole course of the disease, but every function of the body seems to be perverted in some way or another. Thus she may complain of pains and tinglings in her limbs. She may complain of a ball rising in her throat, the *globus hystericus*. She may be over-sensitive and shriek with pain on being touched; or, on the other hand, she may be devoid of all sensation and hold a burning coal in her hand without evincing signs of pain. She may be deaf, or may suddenly lose her voice. Every known form of *paralysis* may be simulated by her, and it will always be noticed that she makes the most of her loss of power. Mentally she is emotional, a passionate lover or a hard hater; she is egotistical, and ever craving for *sympathy*; she shows marked signs of *moral perversion*, often feigning symptoms, such as retention of urine or uterine troubles, in order that she may be subjected to examination by a medical man. She becomes dirty in her habits, and careless of her personal appearance. Such are a few of the thousand

and one symptoms which are exhibited by such cases, and all of them the result of a *mind* diseased, and of that alone. *Hysteria* occurs amongst families of neurotic tendencies, *heredity* playing a prominent part in its causation, but *education* has much to do with its immediate production. The child that is pampered and petted at home, whose every wish is gratified, who is allowed to read and gloat over the "novel with a purpose," and who gets insufficient bodily exercise and fresh air, swells the ranks of the hysterical when she reaches womanhood; so does the physically delicate girl who spends the growing period of her life in cramming her brains with knowledge which her bodily strength will never permit of her putting to any good use.

Treatment.—As hysteria is really a disease of the *mind*, medicines play a very small part in its management, though *valerian* and *assafœtida* are largely employed, and the former drug may be given in the following mixture: Ammoniated tincture of valerian, half-an-ounce; compound spirits of ether, half-an-ounce; compound tincture of lavender, half-an-ounce; and camphor water to twelve ounces. One, two, or three tablespoonfuls of this may be given every two or three hours. For a convulsive attack the best plan seems to be to leave the patient severely alone. Sympathy, or fussing around her, only aggravates the symptoms; whilst if she finds herself alone when she comes out of it, in all probability the attack will not recur. When the disease is of the non-convulsive variety, the best plan seems to be to separate the patient from her unwisely sympathetic friends, and place her under the care of a bright intelligent nurse, who, whilst being invariably kind, can also be firm, and follow the *Weir-Mitchell* system of treatment, which comprises—*rest, dieting, massage, and electricity*. The patient is kept in bed and not allowed to do anything, not even to feed herself at first. The *diet* to begin with should be composed entirely of milk, four ounces of which are given every two hours; after a week or so, whilst the quantity of milk is still maintained, solid food in the shape of a chop at midday and bread-and-butter to supper is added; and the quantities are gradually increased until the patient is having three full meals a day *in addition* to about two quarts of milk. Within a day or two of the commencement of the treatment *massage* is begun, and consists in gentle stroking of the whole body for from fifteen to twenty minutes, two or three times a day; gradually deep massage takes the place of the milder movements, and the whole body is thoroughly treated for an hour and a half at a time. Finally *electricity* in the form of a mild *faradic* current is applied to cause contraction of the muscles. By these means there is a great increase in the tissue-metabolism; the tissues are rapidly being burnt up and the cell elements renewed. This reno-

vation, which is a result of exercise, follows, and leads to improvement in digestion and circulation, and to the ultimate recovery of the patient. Of course all sources of irritation, such as uterine troubles and *constipation*, must be attended to; but the fact must never be lost sight of that, apart from these exciting causes, the disease is due to a *mental perversion*, and that more depends on the *management* of the *individual* than on the *medicinal* treatment of the *case*.

Neurasthenia.—This is a disease closely allied to hysteria, and consists in a weakness and exhaustion of the nervous system, combined with *irritability*. As in hysteria so here, the children of nervous parents, or of such as have led dissolute lives, are prone to the disease, but a large number of cases are the result not of heredity but of *strain*—the worry connected with modern business competition, and the anxiety to grow quickly rich exhausts the reserve of nerve force, especially in such as are not nervously strong to begin with. The same results follow the abuse of drugs, and of tobacco and alcohol; in fact, excesses of every kind. Neurasthenia is also a frequent sequel to attacks of influenza and enteric fever. The *symptoms* vary according to the temperament of the individual; but most patients are low-spirited, and feel unfit for their work, everything is a *weariness* to them. They are always complaining and grumbling about trifles. They become moody and irritable, they lose the sense of proportion and *worry* over trifles. Whilst they are inattentive, they complain that certain ideas keep running through their minds, and that they cannot get away from them. They suffer from *sleeplessness*, and complain of *pressure in the head*. The slightest muscular exertion makes them tired; they are always tired, and they complain of numbness and tingling in various parts of the body, and of pains in the back. Mental exertion is quite out of the question, and they are often unable to do a simple addition sum. The management of such cases divides itself into the steps to be taken to avoid such a condition arising, and to the treatment of the condition itself. With the former object in view, the children of nervous parents must be carefully treated, and every possible pains taken to build up their nervous systems by outdoor exercises and avoidance of *over-pressure* at school. Adults should take care not to burn the candle at both ends, nor, as a patient once put it to the writer, to be in such a hurry as to leave themselves scarcely time to die in. The time spent on the golf links, or by the seaside or amongst the mountains, will result in a reserve of health which no money can buy, and which will give a better return in happiness than the riches of a Croesus. For the condition itself drugs are practically of no use whatever; nothing but *rest* of mind and body

does any good. A six months' voyage on a sailing ship with a bright companion, or residence at one or other of the watering-places where courses of *baths* can be taken, spending the greater part of the day in the *open air*, such are the lines on which the treatment should run. For the very severe cases, especially in women, the *Weir-Mitchell* treatment is admirably suited, and is followed by brilliant results. Drugs such as alcohol, cocaine, and morphia should on no account whatever be administered to such patients.

Headaches.—Pain in the head occurs in all diseases in which the temperature rises, such as the acute fevers. It is also present whenever there is pressure on the brain, as in the case of tumours, inflammation, &c. But there are certain cases in which *headache* is not only the most prominent symptom, but occurs independently of any discoverable disorder of the brain, and is unaccompanied by fever; such a headache is that termed *migraine*, or the "sick headache," which occurs in paroxysms, and, as a rule, at regular intervals of from one to three weeks. A further peculiarity of the affection is that it is accompanied by disorders of *vision* and by *vomiting*. The disease generally runs in families, and women, especially such as suffer from uterine or menstrual disorders, are the most frequent victims of it. It may also be the result of *eye-strain*, or of disorders of the nose, these causes frequently giving rise to it in *children*. Mental fatigue from overwork is another cause, and finally it may be due to *errors of diet*. The immediate exciting cause as a rule being mental or bodily fatigue and indigestion.

Symptoms.—Frequently the patient has some premonitory symptoms which warn her of the advent of an attack. Thus she may suffer from indigestion, or feel chilly, but the most characteristic are disturbances of *vision*. There may be some *dimness of vision* in one eye, or she may see bright spots of light or zigzag lines like the "walls of Troy" pattern, or there may be hallucinations, and she may see the images of cats, mice, and other animals. As these symptoms abate a *pain* commences in the back of one of the eyeballs, and gradually spreads over the whole side of the head. It is of a boring or throbbing character, and so intense that the patient retires to bed utterly prostrated and unable to bear the slightest noise or light.

The face is pale at first, but becomes flushed later. Accompanying the headache there is as a rule some giddiness, nausea, and vomiting, and, as might be expected, a complete loss of appetite. The attack lasts from one to three days, and generally leaves the patient in a weak and prostrate condition. *Migraine* generally leaves women when they arrive at the climacteric period, and men when they pass fifty years of age, but occasionally it continues throughout life.

Treatment.—As *eye-strain* and disorders of the nose are a frequent cause of the disease in children, these should be looked for and remedied if present, whenever a child complains of headache, or of being easily fatigued, or where it is noticed to be *inattentive* at its lessons. In adults, between the attacks they should lead quiet lives free from excitement, avoid all errors in diet, and attend to the bowels. A pill containing 2 grains of blue pill and 3 grains of colocynth and hyoseyamus pill taken at bedtime, and followed in the morning by a dose of Carlsbad salts frequently wards off the attacks. For the attack itself nothing does better than bromide of potash, which may be given in one large dose of 30 or 40 grains, or 10 grains repeated every two or three hours. *Phenacetin* is another drug which often affords much relief, and so does *caffein*. And a combination which often gives immediate relief consists of 20 grains of bromide of potassium, 5 grains of phenacetin, and 1 grain of caffein, made into a powder and taken for a dose, which may be repeated in three hours. When the patient is bloodless, some mild preparation of *iron* should be given in the intervals between the attacks.

Another variety of pain in the head is the *congestive headache*, which may be due to overeating and drinking, or to *constipation*, or to mental overwork and worry. The pain is of a throbbing character, and is intensified by stooping or lying down. The treatment consists in correcting the errors of diet, or whatever may have been the cause of the headache, and in administering a strong *purgative* and applying cold to the head in the form of an ice-cap. A mustard plaster at the back of the neck sometimes affords relief. A dose or two of bromide of potash may be given, but they do not seem to do as much good as a smart purgative and cold to the head.

A third form of headache frequently met with may be termed the *toxic headache*. It results from passing some considerable time in an overcrowded, *badly-ventilated* room, church, or theatre. It is also due to the abuse of alcohol and tobacco, and is one of the symptoms of *lead-poisoning*. The treatment consists in avoiding the cause. Finally there is the *rheumatic headache*, in which the pain is situated in the muscles of the scalp or in those of the hair. The pain is aggravated by movement, and brushing the hair is very painful. A combination of salicylate of soda, 10 grains, and bromide of potash, 10 grains, taken three times a day or once at bedtime, when the pain is not very severe, soon relieves it.

Sleeplessness.—Our knowledge as to what the actual condition of the brain is which induces sleep is very limited; but it seems probable that the same *waste products* which accumulate in the blood and produce *fatigue* after exertion, also act as narcotics, and induce

sleep at night, while on another theory simple tiredness of brain cells may account for the oncoming of sleep. We know that a tired man, if he is not over-tired, goes to sleep more readily than the man who is not tired. During the day, then, waste products accumulate in the blood, by the evening their amount is greatest, and they send the individual to sleep. At night these substances, which are really poisonous, are got rid of by the blood, and in the morning they have practically all disappeared, and the person awakens refreshed. The healthy man who works hard, especially at an occupation requiring muscular exertion, sleeps soundly; the indolent man is, as a rule, a bad sleeper. Of all afflictions, want of sleep is the most trying to a patient, and the one which needs the most careful management at the hands of the physician.

Causes.—These are (1) pain, due to whatever cause; (2) high temperature; (3) disorders of the heart and blood-vessels; (4) derangements of the alimentary system—indigestion, constipation, flatulent distension; (5) conditions of the skin—irritation due to itching, coldness of the surface, cold feet; (6) worry; (7) excessive intellectual efforts; (8) poisons—tea, alcohol, tobacco, taken to excess.

Treatment.—Sleeplessness, the result of *pain* and of general diseases, is treated of under the heading of these several causes. Here we have to deal with it as a result of mental conditions and of the states of the system which can hardly be termed diseases, but are rather derangements passing in their effects. And at the outset it must be laid down that the treatment of sleeplessness by *narcotics* should be the *last resource* of the physician, for this reason, that whilst it is a simple way out of the difficulty to give a man a prescription for some drug, say chloral, which will readily induce sleep, there is no condition in which one runs a greater risk of acquiring a *drug habit* than that of sleeplessness, and many a slave to morphia, cocaine, and chloral owes his downfall to the first sleeping draught he was thoughtlessly given. The first step in the treatment is to discover the cause. Is the man *constipated*? A blue pill at night followed by a teaspoonful of Carlsbad salts in the morning acts like a charm. Is he in the habit of going to bed immediately after partaking of a heavy meal, with perhaps tea or coffee as a beverage? Then remind him of the old saying, "After dinner rest a while, after supper walk a mile," and induce him to follow this advice and give up the heavy supper and also the tea and coffee. Inquire into his sleeping arrangements—is the bedroom properly ventilated? *fresh air* is as much a necessity during the night as during the day. A draught of fresh air is often the best sleeping draught. Has he sufficient covering on the bed? Nothing is so antagonistic to sleep as *cold feet*.

A hot bottle or woollen sleeping socks may be all that is needed. Warming the abdominal organs induces sleep. This may be effected either by applying a warm bottle to the abdomen, or by partaking of a basin of warm gruel or Benger's food before going to bed. This acts as an internal *poultice*, and soothes the patient to sleep. Perhaps the man has too many coverings on the bed. Many a person finds that when he is too warm in bed he sleeps better after taking a few turns round the room or out into the hall.

Sleeplessness is sometimes caused by an irritable condition of the skin, and then sponging the body all over with warm water allays the irritation and induces sleep, and this is especially the case with children, who also benefit greatly from a *warm bath*. Advise the man who is occupied in severe intellectual work to spend a good deal of time in the *open air*, to desist from his work some time before going to bed and read a few chapters of an amusing novel, and take a turn in the fresh air before retiring. Find out how much tobacco the man smokes, and limit him to two ounces a week. Such are some of the simple but efficient means of combating the evil of insomnia; but it may be that we are driven at last to use some narcotic, and then we must bear in mind that the two drugs which are on *no account* to be used for habitual sleeplessness are *opium* and its derivative *morphia*, and that whatever drug is employed it must be only used temporarily. *Bromide of potassium* is the safest hypnotic, and the one which acts best in the sleeplessness due to mental worry and emotional causes. It may be given in doses varying from 10 to 30 grains dissolved in water. *Chloral* has the advantage of acting quickly, but the disadvantage of being a *heart depressant* and a gastric irritant; it should on no account be taken habitually, many of the *sudden deaths* which one hears of so frequently being due to this drug. It may, however, be administered occasionally with advantage, and should then be combined with bromide of potassium, 10 to 15 grains of each being as a rule a sufficient quantity. *Sulphonal* is an absolutely safe hypnotic which has little or no effect on the circulation. It is, however, very insoluble, and therefore acts slowly, and its effects are often not noticeable until the night following that on which it was administered. It should therefore be administered at least one hour before bedtime, and always in combination with bromide of potassium, 10 to 20 grains of each dissolved in a teacupful of warm broth. *Trional* is another and equally safe drug which acts more rapidly than sulphonal, being less insoluble; 15 to 20 grains dissolved in a cup of warm broth is the dose. It should not be given for more than five or six consecutive nights, as it tends to render the urine too acid, and to obviate this difficulty 10 to 30 grains of bicarbonate of soda should be taken

during the day, and the action of the bowels attended to. *Veronal* is also another drug used in sleeplessness, the dose being from 5 to 10 grains, not to be repeated within six hours. *Paraldehyde* is a safe drug, which slightly stimulates the heart. Its disadvantage is that it imparts a most disgusting odour to the breath, and, further, that it has an intoxicating effect when it does not induce sleep. Patients are in the habit of drinking large quantities of it unless they are carefully watched. The dose is from one to one and a half teaspoonfuls in milk or a little warm gruel. No mention has been made of *alcohol* as a hypnotic, because we think it should be classed with opium as a drug absolutely unsuited for administration in sleeplessness, except in the case of people over sixty-five years of age, for whom a little warm whisky and water at bedtime is sometimes very good. It should never be prescribed to young women.

Alcoholism.—The habitual use of alcohol—already alluded to in a preceding volume—to excess leads to certain *degenerations* of the tissues such as atrophy of the nervous system, sclerosis of the arteries, and cirrhosis of the liver, and gives rise to a series of symptoms which have received the name of *chronic alcoholism*, and which declare themselves first in the *nervous* system by the appearance of *muscular tremors*, which are most marked in the hands and the tongue. The individual is unsteady in his gait; he is unable to transact any business until he has had some stimulant; he is restless and fidgety, and cannot sit still even for a few minutes; he is irritable. His intellectual and moral character undergoes great deterioration, his judgment is impaired and his mind enfeebled. Nearly 20 per cent. of the cases of insanity which occur can be traced to alcoholism as their direct or indirect cause. More especially amongst *women* who indulge in *secret tippling*, a form of inflammation in the nerves of the arms and legs termed *alcoholic neuritis* frequently occurs, and causes *paralysis*, which begins insidiously with pain and tingling in the feet and hands, and this symptom is often the first hint that the friends have of the patient's habit. The pain varies in intensity, being sometimes very severe, and the muscles may be sore when they are grasped. The paralysis extends from the feet and hands to the legs and forearms, and even after the habit has been given up some weakness may remain in the feet, giving rise to an awkward walk. Accompanying the paralysis there are often hallucinations, and the patient loses all appreciation of time and distance, one man telling the writer quite seriously, that he had left New York half an hour ago and had had a pleasant voyage.

Alcoholism gives rise to *gastric* disturbances such as loss of appetite, nausea, or even vomiting in the morning, a furred tongue,

and a horrible breath. Catarrh of the stomach is invariably present, and the liver becomes enlarged from congestion. (See section on "Liver Diseases.")

Changes in the *circulatory system*, such as dilatation of the heart and thickening of the arteries, are frequently met with.

When a habitual drunkard goes in for an extraordinary bout of drinking he is apt to suffer from *acute alcoholism* or delirium tremens, which, however, may also result from the sudden cutting off of the supply of stimulants, or may be due to the patient having met with an accident or to an intercurrent attack of *pneumonia*. The attack begins with depression and increased restlessness, the patient sleeps badly for a night or two and then begins to show signs of *delirium*, he talks incessantly to people whom he imagines are in the room, he is never at rest, picking the bed-clothes, drinking imaginary glasses of whisky, going through the several movements of driving, swimming, or playing billiards, or any other recreation that may have been his favourite. He hears voices addressing him, and answers them. He starts with horror at the sight of imaginary rats, snakes, and crocodiles, and unless carefully watched may in his mad fright throw himself out of the window. He is suspicious, and is always looking under the bed or behind the curtains for a hidden enemy. His face is flushed, and his body bathed in perspiration. The pulse is quick. Such an attack lasts from two and a half to three days, during the whole of which period the patient has never slept. When finally sleep does come, it may last from eight to ten hours, and the patient awakens with his mind much clearer, but the tremulousness of his hands and tongue last very much longer. Delirium tremens is very apt to recur, and epileptiform attacks sometimes develop. These are of the gravest import, whilst at other times the patient passes into a state of *coma* and dies. Alcoholism is a hereditary disease, a form of insanity indeed, in which the individual is wanting in self-control. A large number of cases one meets are the offspring of intemperate parents, or of parents suffering from one or other of the various nervous diseases. Apart from heredity, *occupation* plays an important part in the production of drunkards, men occupied in the spirit trade being specially prone to succumb, whilst grief, disappointment, and poverty, acting on weak intellects, also supply their quota to the army of inebriates.

Treatment.—The only cure for chronic alcoholism is *total abstinence*, and this can only be insured by placing the patient in an institution, where amongst healthy, cheerful surroundings his will power will be given the chance of recovering its tone. *Two years* at least needs to be passed amidst such surroundings before there can be any reasonable hope of a permanent cure having been effected. To

confine a man for three or six months is simply throwing away money, as the rule is for him to get gloriously drunk on the night of his release. The difficulty attached to putting a man into an institution rests on the fact that he cannot be put in without his own consent, and this in the large majority of cases is not obtainable. Only when the law recognises the fact that alcoholism is a form of *insanity*, and places it in the same category as other and less serious forms of that disease, will there be any hope of reclaiming the hereditary drunkard. For delirium tremens an experienced nurse is an essential part of the treatment. As a rule no drugs are needed. Opium should certainly not be given to induce sleep, as the ordinary doses seem only to further excite the patient, and large doses may lead to a fatal *coma*. The chief indication is to *nourish* the patient with whipped eggs and milk, beef-tea, meat jellies, &c., and thus to maintain his strength. If the delirium becomes very wild, and the heart is fairly strong, 15 grains each of chloral and bromide of potassium may be given to allay the excitement, and to this may be added half an ounce of the infusion of digitalis if the heart seems to need support. Alcoholic stimulants should be entirely cut off, unless the heart shows signs of failure, as it does sometimes towards the end of an attack. For the *neuritis*, which attacks women more frequently than men, rest in bed is essential. For the pain warm fomentations are soothing, and internally salicylate of soda in 10 grain doses three times a day. The amount of alcohol taken by the patient should be gradually reduced to nothing, and when the acute symptoms have passed off and only the paralysis remains *massage* should be resorted to, and along with it a mild or interrupted electric current should be administered.

DISEASES OF THE SPINAL CORD

Myelitis.—This is the name given to inflammation of the substance of the spinal cord. It may be acute or chronic.

Causes.—1. Injuries to the spine such as fractures. 2. Exposure to cold, lying out in the damp, working up to the knees in water. 3. A sequel to *measles*, smallpox, or typhus fever. 4. Diseases of the bones of the spine, such as Pott's disease or spinal caries. 5. Tumours, such as aneurisms pressing on the spine.

Symptoms.—Acute myelitis generally begins suddenly, and a man may be attacked in the street and find himself unable to get home; but there may be warning symptoms such as numbness and tingling in the feet and legs, and pain in the back. These premonitory symptoms, however, are very rapidly followed by *paraplegia*, or loss of power in the lower extremities. The sensibility of the skin is increased at the beginning of the attack, but this too is soon lost. A

certain amount of fever is present from the commencement of the attack. Soon after the appearance of the paralysis the affected muscles begin to waste, and they feel cold to the touch. Muscular control over the bladder and lower bowel is lost, so that the patient cannot retain their contents. Sometimes the opposite condition of retention of urine is present. The urine becomes alkaline and decomposes in the bladder, giving rise to *cystitis* or inflammation of that organ. The vitality of the skin is greatly lowered, consequently *bed sores* form very readily at the *lower end of the back* and on the *heels* if the greatest care is not taken to guard against them. The course of the disease is variable, many of the cases ending fatally in from five to ten days. Careful nursing is the most important part in the treatment of myelitis. The patient should be placed upon a water bed, and the very strictest attention paid to *cleanliness*. If the urine is passed in the bed, sheets of absorbent cotton should be placed under the patient, and should be removed frequently. The parts of the skin exposed to pressure should be washed with methylated spirit to harden them, and kept very dry. Where retention of urine is present, the water should be drawn off at regular intervals with a soft clean catheter, and any appearance of cystitis met by washing out the bladder with a solution of boracic acid. Internally, salol should be given in 10-grain doses three times a day when cystitis is present. Drugs have no influence over the disease, but *ice-bags* may be applied along the spine. If the patient survives the acute stage *massage* may be tried for the resultant paralysis, in the hope of improving the nutrition of the muscles. Treatment by baths, by electricity, both the continuous and the interrupted currents, by counter-irritation, by residence at such health resorts as Nauheim, Wildbad, Gastein, are all advocated for the paralysis due to myelitis, and to other affections of the spinal cord, but the outlook is far from hopeful, except in the comparatively few cases in which the surgeon can interfere, such as those due to Pott's disease of the spine, where there is often fair hope of affecting some improvement.

Infantile Paralysis.—This disease attacks children during the first three years of their lives, and consists of a localised inflammation of the spinal cord, and is supposed to be due to the sudden clotting of blood in the vessels situated in the particular area of the cord. It is characterised by a sudden loss of power in a group of muscles, such as those of an arm or a leg, by fever, and by the subsequent wasting of the paralysed muscles. The disease occurs more frequently in the summer and early autumn, and is thought to be due to exposure to cold, or to teething, or to the result of a fall from the nurse's arms; but as a matter of fact the actual cause of the disease is not known.

Symptoms.—The child is indisposed for a day or two; he is fretful and feverish, and then the mother notices that one of the arms or legs is motionless. The affected limb is painful to the touch. The paralysis which developed suddenly persists for some time, and then signs of improvement appear, and one after another the muscles may regain their power of movement; but it is very rarely indeed that all of them recover, some invariably remain *permanently* paralysed, and rapidly begin to waste. The growth of the bones of the limb is also arrested, and much consequent *deformity* results. Thus most of the cases of *club foot* which develop after birth are the result of this disease. As a further consequence of the paralysis of certain muscles, those that are antagonistic to them pass into a state of *contraction*, or continuous contraction, and thus add to the deformity.

Treatment.—Usually medical aid is sought only when it is too late to be of much service, but should the case be taken in time, something can be done to diminish the extent of the permanent paralysis. The child should be put to bed and given a sharp purge to clear its bowels, and some simple fever mixture such as 15 or 20 drops of the liquor of acetate of ammonia with an equal quantity of glycerine in water may also be given. The affected limb should be wrapped in cotton wadding and kept warm. The child should be kept lying on its face or side, and mustard poultices applied along the spine. As soon as it can be borne, the affected limb should be rubbed and kneaded, so as to keep up the nutrition of the muscles, and the child should have nourishing food and be carried out into the fresh air as soon as the acute symptoms, fever, pain, &c., have passed off. Later the faradic current may be applied to the muscles, and inwardly one drop of the solution of strychnine given three times a day. For the old-standing cases nothing can be done for the paralysed muscles, but the surgeon by shifting the tendons of the *sound muscles*—tendon transplanting—from one place to another can sometimes do much to repair the deformity, or even restore the limb to much of its usefulness. Where this is impossible, mechanical appliances must be used to support the limb and otherwise aid the patient.

Locomotor Ataxia.—The disease we have just considered—infantile paralysis—is one in which the changes are entirely confined to the *motor areas* of the cord, and consequently the symptoms are solely those of loss of power of *movement*. We have now to consider a disease in which the diseased process—a slow chronic inflammation or *myelitis*—is entirely confined to the *sensory* area, the posterior column of the spinal cord, and in which there is no actual loss of the power of movement, but only that of *sensation*. The patient can lift

heavy weights, but he loses the power of *co-ordination*. The muscular sense is lost; he cannot feel the ground under him, but has the same experience as if he were walking on soft snow. The symptoms of the disease are divided into three stages:—1. The premonitory stage, during which he experiences sharp lancinating *pains* called lightning pains, which shoot down his legs, last only for a few seconds, but are agonisingly painful; and *girdle pains*, which consist in a sensation of painful constriction round the limb. These pains are worse during wet weather, or when the general health is impaired. During this early stage the *eyes* are apt to be affected, and dimness of vision, which, as a rule, passes on to complete blindness; and the *Argyll-Robertson* symptom, where the pupil contracts during accommodation, but is unaffected by light, are present. Another important symptom during this stage is the absence of the *knee-jerk*. In health if the leg is allowed to hang over the side of the bed, and a sharp knock with the side of the hand is given to the knee-cap, the leg involuntarily jerks forwards; this is termed the knee-jerk, and its absence is one of the earliest symptoms in the disease under consideration. In the first stage then, the important symptoms are lightning pains, the Argyll-Robertson symptom, and the absence of the knee-jerk. During the second, which is also termed the *ataxic stage*, signs of the loss of co-ordinating power make their appearance, and generally the first thing the patient notices is that when he is bending down over a basin to wash his face he staggers and is apt to fall. He is apt to fall if he turns quickly. If he is asked to stand with his feet close together and to *close his eyes*, he sways from side to side, and may fall. He is unable to touch the tip of his nose with his finger when his eyes are shut. Gradually the characteristic *ataxic gait* develops itself. The patient walks with his eyes intently fixed on the ground, and his body thrown forward. The legs are far apart, and instead of being placed forwards, are *thrown* forwards and outwards, and the feet come to the ground with a “flop.” The help of a stick, and eventually of two, are generally needed. Whilst all these signs of paralysis are present, there is no actual loss of muscular power, for the patient can resist successfully the bending of an arm or leg. The sensory symptoms which showed themselves in the earlier stage persist in this one, and, in addition, there is slowness in feeling sensory impressions. Thus a prick with a pin on the sole of the foot may not be felt for some seconds, or the patient may not be able to say exactly on what part of his body he was pricked. During this stage the patient is subject to attacks of *pain* in various organs, but more especially in the *stomach*, when they are termed *gastric crises*. The pain in the

stomach is accompanied by an ashy colour of the face, a weak pulse, and *vomiting* of large quantities of greenish-brown fluid. The *third stage* is that of complete *paralysis*, in which the patient has lost all power of walking, and is confined to his bed, and eventually dies of some intercurrent disease such as pneumonia. Locomotor ataxia is a common disease to which men are more prone than women. It generally commences between the thirtieth and fortieth years, and is supposed to be due to over-fatigue, to exposure to cold, to sexual excesses, and to syphilis.

The progress of the disease is always slow, the premonitory symptoms alone may be present for six or eight years before any evidence of the motor symptoms is present; and even after the patient is paralysed he may live for many years.

Treatment.—There is no *cure* for locomotor ataxia, but much may be done to relieve the symptoms and possibly to arrest the disease. The patient should lead a quiet regular life, free from excesses of every kind, but there is no necessity for his giving up his occupation; in fact, the longer he can carry it on the better it is for himself, provided always that it does not entail over-fatigue either of mind or body. In the hope of the disease being due to syphilis, large doses of iodide of potassium are administered, beginning with 10 grains in an ounce of infusion of calumba three times a day, an hour before meals, and gradually increasing the dose to 30 or 60 grains three times a day. The larger doses are, however, not continued for more than two or three weeks. In addition, inunctions of mercurial ointment are advised. Half a drachm of the ointment, mixed with an equal quantity of lanoline, being rubbed into the inner side of the thigh or the front of the abdomen, and the part afterwards covered with a flannel bandage. Nitrate of silver has many advocates, and is said to have done good in several cases. A pill containing a quarter of a grain of the salt, mixed with kaolin, is given three times a day. For the severe pains, rest in bed is the best plan, and counter irritation in the form of a blister may be employed. Antipyrin in 5 or 10 grain doses three times a day, or salicylate of soda, 10 to 20 grains, three times a day may also be tried; but eventually, in most cases, hypodermic injections of morphia have to be resorted to—these, however, should be delayed as long as possible, and care taken that the patient does not contract the drug habit. For the gastric troubles, mustard plasters to the pit of the stomach afford relief, but morphia may be needed. Attention must be paid to the condition of the *bladder*, and if retention is present the urine must be drawn off at regular intervals, or the patient taught how to do it himself.

DISEASES OF THE PERIPHERAL OR EXTERNAL
NERVES

Neuritis.—Inflammation may attack a single nerve, or many nerves may be involved. In the latter case the disease is termed *multiple neuritis*. Neuritis attacking a single nerve is generally the result of a *cold*, or it may be due to *injury* to a nerve, the result of a wound, or of pressure on the nerve; and, lastly, it may be due to the extension of inflammation to the nerve from some neighbouring part. And this cause is very well illustrated in cases frequently met with, where a patient suffering from a *suppurating ear* gets paralysis of one side of the face from involvement of the nerve, which lies very near to the ear. Multiple neuritis is the result of a general *poisoning* of the system, the commonest examples of the disease being *alcoholic neuritis*, which has been treated of under alcoholism; *post diphtheritic paralysis*, which is due to a neuritis set up by the diphtheria poison; and *lead palsy*, which is common amongst workers in lead. The *symptoms* of neuritis confined to a single nerve are *pain* along the course of the nerve, numbness and tingling, followed frequently by the appearance of a *herpetic eruption*. There is generally some twitching of the muscles, and any movement is attended by pain, and ultimately the muscles that are supplied by the affected nerve may atrophy. The *treatment* consists in *rest* in bed, and warm applications in the form of mustard poultices or warm fomentations along the course of the nerve; whilst *internally* salicylate of soda may be given to relieve the pain. When all tenderness has passed away, gentle massage and the interrupted electric current may be employed with advantage.

The Facial Nerve which supplies the muscles of the side of the face is frequently attacked by inflammation, which causes paralysis of one half of the face, the affection being termed *Bell's palsy*. This condition may be the result of *exposure to cold*, people driving on a cold night in an open vehicle being frequently attacked, or, as is very frequently the case *in children*, it may be the result of inflammation spreading from *the ear* to the nerve; and, lastly, it may be due to disease in the brain. The symptoms of the disease are very characteristic, one half of the face is quite immobile, the skin is smooth and the wrinkles are all effaced. When the patient laughs or smiles, the face is drawn over to the sound side, and in long-standing cases remains permanently so deformed. The *eye* on the affected side cannot be completely closed, and consequently waters

profusely. When chewing, portions of the food collect on the affected side, as the cheek cannot help to move the mass away.

Treatment.—When the condition arises in a child who is suffering from a chronic discharge from the ear, surgical interference is called for to give a free exit to the discharge. When it is the result of cold, the face should be protected from exposure to draughts by applying cotton wadding to the side of the face, and keeping it in position with a piece of flannel. Hot applications should be made to the side of the face from time to time during the twenty-four hours, and a blister should be applied to the back of the ear. Medicinally, the treatment should begin with a dose of calomel to clear out the bowels, and iodide of potassium in 5 or 10 grain doses in an ounce of the infusion of calumba administered three times a day, an hour before meals. Finally, massage and the continuous current may be employed to restore tone to the muscles. Cases the result of cold, as a rule make complete recovery.

The Sciatic Nerve, which is situated at the back of the hip-joint, is frequently the subject of neuritis, giving rise to the painful disease termed *sciatica*, which may result from exposure to cold or be due to *rheumatism*; but it may also be due to the pressure of *tumours* in the pelvis, or even, when it is on the left side, to accumulations in the bowels, the result of chronic constipation. The *symptoms* of *sciatica* are *pain*, which shoots down the thigh to the foot, and is aggravated by walking, and *painful points* along the course of the nerve, which are painful to touch. The patient walks as a rule with his *knee bent*, to relax the nerve and thus relieve the pain. The disease is a very obstinate one, and the *treatment* has to be changed frequently, one method of attack after another proving a failure. For severe cases the best plan seems to be to keep the patient at absolute rest in bed, and to apply a *long splint* to the affected limb, just as if a bone had been broken. Of course the possibility of the disease being due to the pressure of some internal growth will be kept in mind, and this point cleared up before any treatment is begun. In milder cases, applying powdered *sulphur* to the limb, and keeping it in position with a flannel bandage, sometimes does good. Applying *fly blisters* along the course of the nerve is another method which may be tried, a small blister about the size of a florin being allowed to remain on for an hour or two, and then removed to another position over the nerve. Pushing sharp steel needles into the nerve (*acupuncture*) does good sometimes, or injecting distilled water into the sheath of the nerve (*aquapuncture*) may be tried. Lastly, *dry cupping* along the course of the nerve is frequently followed by marked alleviation of the pain. Internally, if the *sciatica* is of rheumatic origin, salicylate of soda or

salicin should be given, whilst for the immediate relief of the pain 10 to 15 grains of Dover's powder is a suitable remedy. If *morphia* has to be given it must always be administered hypodermically by a medical man; the injection of *distilled water* often has quite as good an effect. Brine baths, sulphur baths, and mud baths may also be tried, and residence at Droitwich, or Harrogate, or Strathpeffer is often followed by great improvement.

Neuralgia.—This is a painful affection of the peripheral nerves somewhat akin to neuritis, but the pain may or may not be due to inflammation. It affects women more frequently than men, and is frequently a complication of *debilitating* diseases such as *anæmia*, or may be rheumatic or gouty in its origin. Like neuritis it often follows exposure to colds, or may be the result of irritation such as neuralgia of the face, which is often set up by a diseased tooth.

Symptoms.—Neuralgia is as a rule confined to one side of the body, and there are generally some premonitory symptoms such as sensations of tingling and prickling along the course of the nerve about to be attacked. The *pain* is often of an excruciating character, and comes in paroxysms and increases in intensity; it is subject to remissions and to fresh exacerbations. The attacks are apt to return at regular intervals. Tender points are generally present along the course of the nerve, and crops of *shingles* or herpes are apt to appear. A nerve which is affected more frequently than any other is the fifth or *trifacial*, which is the *sensory* nerve of the face; it has three branches, any of which may be affected. When the *supraorbital* branch is the seat of the disease the pain starts above the eye, and spreads upwards to the top of the head. When the *infraorbital* branch is affected the upper jaw and the teeth in the upper gum are painful, whilst when the third division is affected the lower jaw is painful. Decayed teeth frequently give rise to reflex neuralgia in this nerve. The most painful and obstinate variety of the disease is that termed *tic douloureux*, for which frequently no cause can be discovered, and no treatment, however heroic, is successful. The *intercostal* nerves are often the seat of neuralgia, more especially in hysterical women. In this situation the disease is often mistaken for pleurisy. Crops of herpes ("cold spots") frequently accompany or precede the pain. The *treatment* of neuralgia will depend upon the cause, and an endeavour should always be made to discover this, and remove it if possible. When it is due to *anæmia* or general debility, change of air, especially to a mountainous district, often effects a cure, whilst *tonics*, especially arsenic and iron, are of the greatest benefit, and *massage*, by improving the general health, does much to relieve the symptoms. In the gouty and rheumatic cases a course of baths at Buxton, Harrogate, or Strath-

pepper do much good, whilst medicinally, salicylate of soda, iodide of potassium, and colchicum are indicated. A mixture containing iodide of potassium, 2 drachms; bicarbonate of potash, 6 drachms; wine of colchicum, 2 drachms; and camphor water, 12 ounces, of which a tablespoonful in water is given three times a day after meals, often proves very efficacious in gouty neuralgia. *Locally* warm applications and blisters, as suggested for sciatica, may be tried, or the painful area may be gently rubbed with a stimulating liniment combined with a soothing one, such as equal parts of compound camphor liniment and belladonna liniment, or a combination of equal parts of compound mustard and opium liniment. For facial neuralgia due to decayed teeth the following *toothache tincture* can be recommended: Tincture of opium, half drachm; chloroform, half drachm; creosote, half drachm; and compound tincture of benzoin, one drachm. A few drops on cotton wool to be placed in the hollow of the decayed tooth. Of *drugs* for the relief of the pain *antipyrin* is one of the most popular, but must be taken with caution as it is a *heart depressant*; 10 grains may be taken to begin with, and then 5 grains every three hours after, till four doses have been taken. *Phenacetin* is safer and possibly a more efficient drug; 5 to 10 grains may be taken every hour till three doses have been taken, or the phenacetin may be combined with 10 grains of bromide of potassium and 1 grain of caffeine.

Exalgin is another drug which sometimes acts like a charm; 24 grains may be dissolved in 2 drachms of rectified spirit and added to 3 ounces of orange flower water, which has been sweetened with simple syrup. A teaspoonful of the mixture may be taken every hour for six hours. For facial neuralgia, not the result of decayed teeth, butyl chloral hydrate does well; a pill containing 3 grains of the drug may be taken every four hours for four doses. Finally, the hypodermic injections of morphia have frequently to be resorted to; these, however, should always be administered by the medical man in attendance, for of all diseases neuralgia is the one most liable to seduce a patient into becoming a slave of the morphia habit.

Professional Spasms.—The prolonged and excessive use of certain groups of muscles often results in their being thrown into a state in which they are subject to involuntary *spasms* which prevent the individual following his usual occupation. The condition is most frequently met with amongst writers, hence *writer's cramp* may be taken as a type of the affection, which, however, is also found amongst telegraph clerks, cigarette makers, and musicians. The *symptoms* consist in a sudden spasm of the muscles which have been strained whenever the patient begins to work. Thus a clerk, when he begins to

write, finds his pen is suddenly jerked out of his hand by a spasm of the muscles of the thumb and forefinger, or that his whole forearm is jerked away from the paper. In addition to the spasm there is generally some *pain* in the hand and forearm.

The condition is due to muscular strain produced probably by a faulty method of wielding the pen, using the wrist as the fixed point rather than the elbow. The *treatment* consists in complete *rest*, with massage for the affected muscles, and altering the method of holding the pen and forearm, using the *elbow* as the fixed point. Sometimes the sufferer has to learn to write with his left hand, or even to give up his occupation entirely. The use of massage is also to be recommended, and it is said that type-writing acts as a cure in certain cases.

SECTION III

STRUCTURE AND DISEASES OF THE EAR

STRUCTURE AND PHYSIOLOGY

[*The Coloured Plate of the Ear (p. 64) should be studied in connection with this Section.*]

LIKE the eye, the ear is an organ of sense, and may be described as one of "the gateways of the brain." Each organ of sense is in reality an apparatus whereby the special impressions it receives from the outer world are presented to the brain in such a form that the organ of mind can ultimately receive and pronounce judgment upon them. Having regard to this view of a sense organ we note that we do not really hear with the ear, seeing that the ear apparatus only modifies and prepares the impressions it receives for appreciation by the brain. Therefore to certain parts of the brain may be referred the duty of hearing, which is to be regarded as a mental action, and as one capable fully of presenting to the judgment of our consciousness the messages derived from the outer world. We further note that each sense organ is affected by certain impressions only. The optic nerve, or that of sight, is sensitive to light waves only, just as the nerve of hearing is affected by sound waves alone. Each sense organ in this way may be regarded as a specialised part of the nervous system set apart for the reception of certain impressions to the exclusion of others.

About Sound.—Dealing first of all with certain facts relating to sound, we may regard the source of all our knowledge derived by the ears from the outer world as existing in the form of *sound waves*.

Sound is in fact "a mode of motion" just as light waves may be classified under the same head. The stirrage, so to speak, of the air around us produced by the vibration of, say, the human voice, or the strings of a musical instrument, gives rise to the waves in question. These received by the ear as we have seen are duly modified for their conveyance to the brain. We all know that in the absence of air, sound waves are very considerably altered or may be abolished altogether, at least in the sense that they do not reach our ears, whilst sounds conveyed through water, or even passing over the surface of water, are similarly liable to be modified. Sound waves usually travel at the rate of 1090 per second at a relatively low temperature. If the heat of the air is increased, the waves travel more quickly. With regard to definite sounds, such as those emitted by musical instruments, we find that they differ from the sounds we term "noises" in that whilst the vibrations of the noise are of irregular character, musical sounds show regular and rhythmical sound waves. If we experience a loud musical sound we may assume that its intensity depends on the size of the wave, this last in turn naturally depending on the extent of the vibration which produced it. What is known as musical "pitch" is explained as depending upon the number or frequency of vibrations taking place in a given time. If such vibrations reach the ear either in too slow a fashion or too rapidly, no musical sound may be perceived at all. The ear may appreciate musical tones which arise from vibrations representing rates varying from 30,000 to 40,000 per second. It is stated that the range of the tones employed in music may ordinarily be regarded as existing between the limits just noted. In the case of a tuning-fork, the vibrations of which may be regarded as moving at say 100 times per second, a certain tone will be produced. When the rapidity of these movements is increased to 200 vibrations per second a note of a higher pitch is naturally sounded, the higher note representing practically the octave of the former note. A physiological authority dealing with the pitch of the human voice in singing, tells us that it may fall as low as 87 vibrations per second, whilst in good soprano it will rise to 768 vibrations per second. It is rare to find singers capable of going beyond these limits, but in one case a basso singer varied from 42 vibrations to 435. In the case of a lady soprano, her highest amount was 1365 vibrations per second, whilst a soprano of the eighteenth century is said to have ranged from 192 to 2048 vibrations. This last is declared to be the most highly pitched voice known to musicians. The same authority sets down the extreme range of the human voice, taking into account the last-named example, as ranging from 42 vibrations to 2048, or about six octaves. On the other

hand, the range of the human ear for musical tones ranges from 32,000 vibrations to nearly 40,000 vibrations, or about eleven octaves.

The Quality or Timbre of Sound.—When one speaks of the quality or timbre of sound one means to indicate practically the source of the sound, particularly with reference to the instrument which has produced it. The same note sounded upon different instruments differs materially in timbre. The human voice, for example, has a quality of its own, and different voices exhibit differences in this respect. So also, we perceive and can readily distinguish between the timbre of a note produced by the violin, and one produced by, say the flute. These differences are due to variations in the amount of sound waves produced by the instruments in question. An author graphically describes this difference when he says: "What complicated forms the wave may take can be readily imagined if we think of the effect produced on the surface of the sea by a gale of wind. The great rollers have their crust buffeted and broken by conflicting gusts, their surface roughened by a thousand waves and ripples. No two great waves seem exactly alike. Such a disturbance of the atmosphere affecting the ear would give rise simply to a noise, but let the great waves, irregular as they may be, succeed each other as exact copies one of the other, then we will have the musical tone, whose pitch or fundamental tone is that of the largest waves, but whose quality is determined by the combination of waves and wavelets into one." It can readily be seen that the ear must be of extremely delicate structure in order to be capable not merely of simply hearing sounds, but of distinguishing the various qualities so to speak which sounds exhibit. In this sense, the ear may justly be described as the most complicated part of the human anatomy.

The Ear Itself.—Anatomists are accustomed to classify the ear into three distinct parts. These are respectively the *external* or *outer* ear, the *middle* ear, and the *internal* ear. Under the phrase "external ear" are included first the *auricle* or *outer* ear itself, second, *the opening* of the ear, and third, *the canal* or passage into the ear. The outer ear or *auricle* is a structure which has long attracted the notice of anatomists. The ear, simply regarded like other organs of sense, may be said to consist of certain parts adapted for the reception of the particular impressions it is intended to receive; second, of an apparatus for modifying such impressions; and third, of a special nerve (in this case the *auditory nerve* or that of hearing) whereby the impressions so modified are carried to the "hearing-centres" represented in the brain. It is not necessary here to say anything regarding the particular brain centres which receive and

deal, like a mental sub-office, with the messages received from the organ of hearing. This subject will be found discussed in the section dealing with the structure and functions of the nervous system at large. The simplest ears are those we find represented in such animals as jelly fishes and allied forms of life. In them we find a simple sac which may either open on the external surface of the animal's body or may represent a closed bag. Inside such a simple ear organ we may find fluid contained with small mineral particles called *otoliths*. These last apparently have the function of intensifying by their movements the vibrations communicated to the ear by the sound waves. Such a primitive ear is of course connected with the nervous system of the animal by a nerve of hearing. In addition we may find in such organs of hearing structures known as *auditory hairs*. These last no doubt act in some fashion or other in aiding the reception of the vibrations transmitted to the ear. In such an animal as the lobster, for example, the ear exists in the base or first segment of the lesser pair of feelers arising from the head. A curious fact with reference to the mineral particles contained in such ears is that the animals pick up grains of sand and place them in their ears in order to serve as "otoliths." Hensen, in examining shrimps after the moulting process in which the lining membrane of the ear is also parted with, placed crystals of uric acid in the sea-water in which they were kept. After moulting, a few grains of sand were found in the ears, but later on, crystals of uric acid were discovered in the organ of hearing. He remarks that evidently therefore such animals pick up grains of sand and introduce them into their ears. Between simple ears of the kind described and the complicated apparatus of hearing found in man and his neighbour animals there are necessarily all stages and gradations, but it is possible to trace even in simple ears of the kind described a certain relationship to the highest type of the organ of hearing. In other words the latter simply represents the evolution of the higher ear from the simpler type.

The Outer Ear.—Every one must have noticed the peculiar shape of the outer ear and also noted its variations in different individuals. It is composed of cartilage or gristle covered by skin of a somewhat delicate texture. Between the skin and the cartilage, and also associated with the tissues of the outer ear itself, we find a number of rudimentary muscles. These in man are of no use, seeing that the ordinary individual cannot move his ear as is the case with most lower animals; but occasionally in the human subject these muscles acquire a certain amount of power, and in such cases the individuals are able, so to speak, to "wobble their ears." The lowest and most dependent part of the outer ear is called the *lobule*.

Here we find a certain amount of fat and also fibrous tissue. The opening of the ear leads into the passage through which sounds gain admittance to the internal ear. This opening, together with the particular formation of the auricle itself, favours the easy passage of sounds inwards. The function of the outer ear itself may be regarded as that of arresting sound waves, and the action of a deaf man who puts his hand to his ear is simply directed to increasing the outer ear area or surface by arresting the waves of sound. The passage into the ear is called the *external meatus*. This canal runs inwards and slightly forwards. In length it is about $1\frac{1}{4}$ inches long. It is of oval shape, and narrows somewhat towards the centre, whilst its base or floor is somewhat raised in the middle. The opening is provided with fine hairs which no doubt exercise some protective function. Included in the structure of this auditory canal we find glands known as *ceruminous glands* or *wax glands*. These glands secrete the substance familiarly known as *wax* or *cerumen*. They are allied in their nature to the sebaceous glands of the skin described in the section dealing with that subject as supplying a kind of oily or fatty matter devoted to maintaining the skin in proper order. The secretion of wax in the ear tends to maintain the canal in a moist state. When, however, from one cause or another, the secretion of wax takes place to an unusual degree, masses of that substance tend to block up the canal, and thus seriously to interfere with hearing.

The Middle Ear.—The *middle ear*, as well as the *internal ear*, include structures enclosed within the dense substance of the temporal bone of the skull. The first portion of the middle ear is known as the *drum* or *tympanic membrane*. This membrane closes the ear canal in a complete manner, so that the canal itself resembles a blind alley, or street without an opening. The drum of the ear presents itself as a membrane of thin structure. It is of oval shape, and exhibits a depression or slight hollow on the outer side towards its middle portion. This hollow is caused by the membrane being somewhat drawn inwards through the attachment to it of one of the small bones of the ear, known as the *malleus* or hammer (Fig. 22, *M*). It is the handle of this “hammer bone” which is attached to the drum. On the inner side of the drum we find a small recess or cavity, which is called the *cavity of the middle ear*. This compartment is lined with mucous membrane, a structure which we are familiar with as also lining the nose, mouth cavities, and other parts of the body. It will be understood that the drum of the ear closes this cavity on the outer side. When the inner wall of the compartment is investigated, two openings are discovered to exist. One of these openings is called the

fenestra ovalis, or "oval window." The other is called the *fenestra rotunda*, or "round window." The former of these communicates with another compartment called the *cavity of the vestibule*. In it is also found the foot of another small bone of the ear, known as the *stapes*, or *stirrup bone* (*Et*). The other, or round window, opens into one of the staircases of that portion of the inner ear known as the *cochlea*. In front, the cavity of the middle ear communicates with the throat by means of a tube called the Eustachian tube, which opens on each side at the back part of the mouth. This communication explains to us why, in cases of severe cold in the head, deafness may result through inflammation extending up the tube and affecting the ear parts. In the same way it is probable that disease of the ear, common after scarlet fever and measles, may be explained on the assumption that infection has passed up this tube towards the ear.

The function of this tube is apparently that of maintaining an equal pressure of air on each side of the ear drum. The Eustachian tube remains, as a rule, in a closed condition, but in the act of swallowing it opens. A simple experiment may prove this, for if the nostrils be firmly closed, and also the mouth, and the act of swallowing be gone through, pressure is felt in the ear, and the hearing for the time being is affected. It would seem in this way that the pressure of air induced by this action affects the tube, and in turn acts upon the drum. Into the tympanic cavity, it may be added, at its hinder parts we find certain cells opening. These are named the *mastoid cells*.

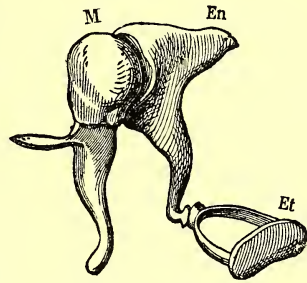


FIG. 22.— The Ossicles of the Ear.
M, Malleus; En, Incus; Et, Stapes.

The Ossicles of the Ear.—Reference has already been made to small auditory ossicles, or ear bones, connected respectively with the drum and with the inner wall of the tympanic cavity (Fig. 22). These bones are three in number, and they may be described as being placed across the cavity of the middle ear. They practically connect the drum on the outer side with the "oval window" on the inner side. Serious defects of hearing naturally occur when, from one cause or another, the movements of these bones are interfered with, just as defects of hearing naturally arise when, say, in scarlet fever or measles, or from any other cause, the drum of the ear is perforated or destroyed. The ossicles (Fig. 22) are respectively known as the *malleus* or *hammer*, the *stapes* or *stirrup*, and the *incus* or *anvil*. They are so named from their resemblance to the familiar objects in question. It is the handle of the hammer bone which is attached to the inner surface of the

drum, whilst a projection from this point connects it to the wall of the chamber. By its round head the hammer bone joins the anvil bone (*En*), a distinct joint representing the connection. The anvil bone in turn is connected to the stirrup bone (*Et*), and the flat part of the stirrup bone we term the plate is connected by a membrane, and fixed into the "oval window" of the inner wall of the middle ear chamber. We thus find a chain of bones stretching across the compartment, and connecting the drum on the one side with certain structures on the other or inner side. It is on the inner side of the "oval window" that we find the parts of the internal ear—the most complicated portion of the organ of hearing—and that more essentially concerned with the modification of sounds. It is this "oval window," or rather the membrane which it represents, which is connected with the stirrup plate, this last forming the connection between the middle and the internal ear.

The Uses of the Ossicles.—Having described the arrangement of parts of the ear, it is necessary now to note the functions they discharge. In the act of hearing, sound-waves pass into the ear canal and strike against the drum. This membrane is, accordingly, thrown into vibrations corresponding in their nature and number with the nature of the waves which have reached it. The vibrations of the drum, it is clear, will be conveyed in turn to the chain of small bones we have just described. The result of this arrangement is ultimately to convey the vibrations to the stirrup bone, and through it to the membrane which closes the "oval window." These vibrations affect both the stirrup and the membrane, so that naturally they pass inwards to the internal ear. Three very small muscles are connected with the ear bones. The first of these is known as the *tensor tympani*. This passes into the hammer bone by the root of the handle, its function being to draw the middle of the drum inwards, and so tighten it. The second muscle is known as the *laxator tympani*. This muscle relaxes the drum of the ear, and therefore exhibits an opposite action to the *tensor*. The third muscle is known as the *stapedius*. This is attached to the neck of the stirrup bone. Its function appears to be that of regulating the movements of the stirrup, and of thus preventing its vibrations from injuriously affecting the "oval window."

The Internal Ear.—All the parts just described may be regarded as devoted simply to the conveyance of sound vibrations to what is the essential part of the organ of hearing, namely, the *internal ear*. This last has been already described as at once the most complicated part of the organ of hearing and the complex structure of the human body. Its parts are enclosed in the

thickened and solid portion of the temporal bone. The first part of the internal ear is that known as the *vestibule*. This is a compartment averaging about one-fifth part of an inch in diameter. It exists immediately on the inner side of the oval window of the middle ear. At the back portion of the vestibule certain openings are found. We thus note situated three tubes, named from their peculiar shape the *semicircular canals*. (See Plate in this volume.) The average diameter of these canals is about the one-twentieth part of an inch, their curve amounting to about a quarter of an inch in diameter. One of the canals lies horizontally, another is directed backwards and a third upwards. The upper and the hinder canals are united by their further ends and also open into the vestibule by one and the same aperture. There are thus five openings in all into the vestibule of the ear. At the base of each semicircular canal we find a slight expansion known as the *ampulla*. The second structure of the internal ear is known as the *cochlea*, which is invariably described as resembling a snail-shell in respect of its coiled shape. This structure lies to the front part of the vestibule. At the base of the *cochlea* we find the opening of the round window, so that the *cochlea* is placed in communication with the middle ear in this fashion, although the opening like that of the "oval window" is closed by a membrane. The cochlea itself consists of a spiral tube or canal winding around a central shaft known as the *modiolus*. From this central shaft arise certain partitions of a bony nature dividing the interior of the cochlea into three distinct channels. It may be added that in addition to the openings thus described in connection with the vestibule of the ear, its inner walls exhibit other apertures through which the branches or divisions of the nerve of hearing enter it. The name *bony* or *osseous labyrinth* is given to the part of the ear just described. These structures contain a fluid called the *perilymph*. In this fluid in turn we find situated certain structures called the *membranous labyrinth* for which the "osseous" or "bony labyrinth" forms therefore a kind of case. The membranous labyrinth is represented by two sacs or bags named respectively the *utricle* and the *saccul*. From the utricle we find given off the membranous labyrinth represented by semicircular canals which occupy the bony cavities already described, whilst the *saccul* in its turn communicates by a slender tube or canal with the membranous parts of the inner ear contained in the bony *cochlea*. This canal is called the *canal of the cochlea*. In this way it may be said that the whole of the membranous labyrinth or soft structures contained in the bony parts of the internal ear are placed in communication with one another.

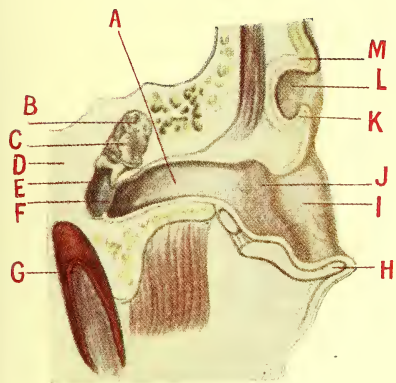
The other Ear Structures.—When the membranous parts of the semicircular canals are examined their inner surface is found to be lined by *epithelial cells*, whilst it also gives origin to extremely fine hair-like filaments which float in the thin fluid with which the membrane is filled. This fluid is known as the *endolymph*. It is found also that branches of the nerve of hearing are supplied to the sacs of the vestibule and also to the membranous canals. It is believed by certain authorities that the ends of these nerve fibres are connected with the delicate hairs just described. Inside the large sac or utricle of the vestibule we find *otoliths* such as were described as existing in the ears of lower forms. These consist of very small crystals of carbonate of lime. Turning finally to the softer membranous parts included in the *cochlea* we find here the most complex part of the ear. In a certain portion of the *cochlea* for example we find contained a very remarkable organ called *the organ of Corti*. This organ rests on a membrane known as the *basilar membrane*. It consists of a large number of fibres known as *the fibres of Corti*. Each fibre consists of two portions, the ends of which meeting form a kind of arch. It is estimated that in the ear of man over 3000 of these arches are found. They have been described as presenting when viewed from above an appearance similar to the keyboard of a piano. Resting on these arches we find certain peculiar *epithelial cells*, these cells bearing bundles of stiff hairs or filaments, whilst in the bases of the cells the ends of those branches of the nerve of hearing which supply the organ of Corti are found. It may be said with respect to this organ and its cells, that they represent the ultimate parts of the ear where sounds are so modified that they are suited and adapted for direct transmission to the brain.

The Mechanism of Hearing.—We have seen that sounds received by the outer and middle ear are ultimately transmitted to the complex parts described as forming the internal ear. Seeing that the organ of Corti represents the terminal portion of the organ of hearing, we may form some notion of the manner in which the modified sound waves are conveyed to the brain, when we reflect that probably each hair of this organ is sensitive to a particular sound wave. When any sound reaches the internal ear as already described, its waves set the fluid in the membranous or soft part of the cochlea into vibration. The waves thus evolved will exhibit different lengths, but if we suppose that each hair of the organ of Corti vibrates in unison with one wave, and with that alone, we may regard the whole organ as resembling in one sense a very elaborate sounding-board. In the case of a complex wave of sound including many different wave

STRUCTURE OF THE EAR.

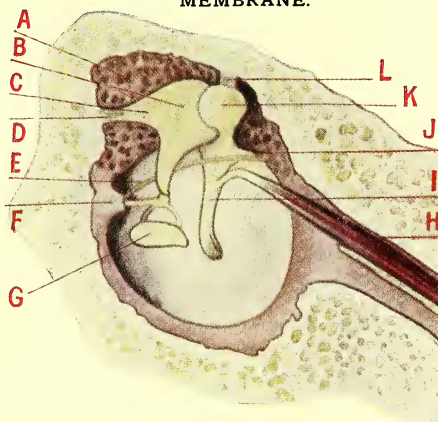
DRAWN FROM ACTUAL DISSECTIONS BY E. BURNET, B.A., London.

SECTION—RIGHT EAR.



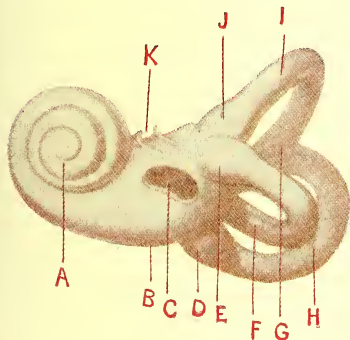
- | | |
|---------------|-------------------------|
| A. J. Meatus. | F. Tympanic Membrane. |
| B. Recessus | G. Internal Carotid |
| C. Malleus. | Artery. |
| D. Cochlea. | H. I. K. L. M. Parts of |
| E. Tympanum. | External Ear. |

INNER VIEW OF LEFT TYMPANIC MEMBRANE.



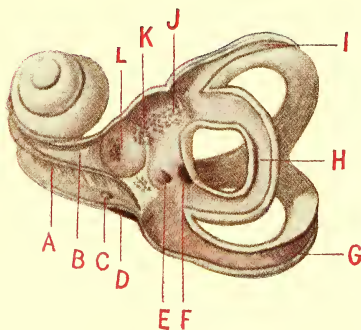
- | | |
|----------------------------|-----------------------------|
| A. Recessus | F. Pyramid. |
| B. Body of Incus. | G. Stapes. |
| C. Short Process of Incus. | H. Eustachian Tube. |
| D. Ligament of Incus. | I. Handle of Malleus. |
| E. Chorda Tympani | J. L. Ligaments of Malleus. |
| Nerve. | K. Head of Malleus. |

LEFT BONY LABYRINTH
(From Outer Side).

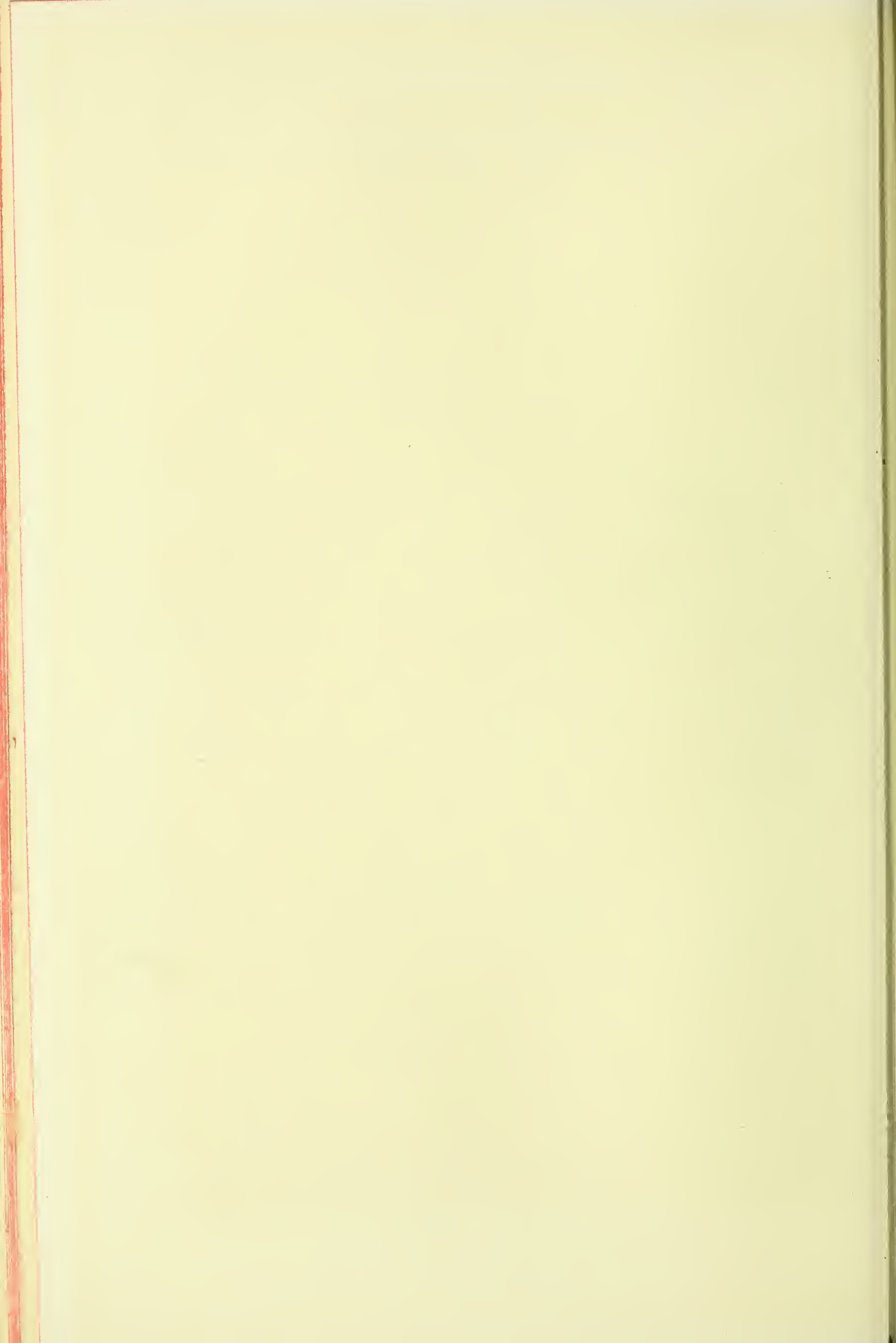


- | | |
|---------------------------|----------------------------|
| A. Cochlea. | G. Crus Commune. |
| B. Fenestra Rotunda. | H. Posterior Semi-circular |
| C. Fenestra Ovalis. | Canal. |
| D. E. J. Ampullæ. | I. Superior Semi-circular |
| F. External Semi-circular | Canal. |
| Canal. | |

LEFT BONY LABYRINTH
(Interior).



- | | |
|--------------------------|----------------------------|
| A. Scala Tympani. | G. Posterior Semi-circular |
| B. Scala Vestibuli. | Canal. |
| C. Opening of Aqueductus | H. External Semi-circular |
| Cochleæ. | Canal. |
| D. Fenestra Rotunda. | I. Superior Semi-circular |
| E. Opening of Aqueductus | Canal. |
| Vestibuli. | J. Fovea Hemi-elliptica. |
| F. Opening of Crus | K. Crista Vestibuli. |
| Commune. | L. Fovea Hemispherica. |



lengths reaching the organ, we may imagine each hair to select its own wave whilst the multitude of hairs set vibrating will, so to speak, analyse the complex sound out into its constituent elements. If in this way the ear be regarded as analysing sound waves in the manner described, these impressions duly conveyed to the brain must be dealt with in turn by that organ and reunited so as to give us the ordinary sensations of hearing. It may be remarked that some authorities regard the basilar membrane rather than the organ of Corti as representing the tone-analysing part of the ear. This opinion has been somewhat strengthened by the fact that birds which can certainly distinguish notes do not possess any rods of Corti in their ears. However we may regard the functions of different parts of this remarkable organ it is obvious that, taken as a whole, it is the most important part of the internal ear, and that to which all the other parts are subsidiary in function.

A final fact with regard to the ear is that which throws some light upon the functions of the semicircular canals. There seems to be little doubt that the canals, whilst no doubt performing certain functions in the transmission of sound to the cochlea, are also connected with *the preservation of the equilibrium of the body*. When they are diseased or affected, disturbance of the body's equilibrium is apparent. The disease known as "Menière's Disease" is caused by some alteration in the semicircular canals. If these semicircular canals be destroyed, no impairment of the sense of hearing results, but an animal so treated performs peculiar movements, each movement corresponding to the particular canal affected. If either vertical canal exhibits an injury the animal is seen to rotate its head around an axis placed horizontally at right angles to the plane of the canal, whilst if a horizontal canal be injured, rotation of the head tends to take place around a vertical axis.

DISEASES OF THE EAR

The ear shares with the eye the premier position as an organ of special sense. If the power of hearing is wanting, or considerably interfered with, the sufferer loses so much of the joys of life that there are those who claim that his state is even more pitiable than if the like defects occurred in the organs of sight. However this may be, we know that our heart often goes out in sympathy to many a fellow-being who in the midst of soul-inspiring music, or, maybe, interesting and animated conversation, has the bitter consciousness that he cannot appreciate for lack of hearing what to others give

obviously the greatest pleasure. The period when diseases of the ear are most common is from infancy to about sixteen, and although at this time they are more amenable to treatment than they become as age creeps on, they are, unfortunately, either undetected or neglected in proportion. No doubt an important cause of this greater incidence in children is that this era of life is the one in which the infectious fevers are most common, and these, as will be shown, are an important factor in the causation of ear diseases. By no means all of the affections of the ear which lead to deafness are due to such acute conditions as fevers, however; many are most insidious, and owe their origin to various causes. To use an old but undeniable quotation, "the hand that rocks the cradle rules the world," and we conceive that in no more potent way do mothers do this, well or otherwise, than in the way in which they tend to the health of the generations who in such important and dangerous years are in their sole care. How necessary then for women to take pains to acquire a knowledge of the conditions that contribute to health or disease in childhood. Every day doctors are shocked at gross ignorance of these things in all stations of life, and in nothing is the result so disastrous as in the diseases of the ears or eyes.

Before we proceed to the consideration of individual diseases of the ear, it will be well therefore to discuss somewhat at length the care of the ears in health. Even from their earliest days they require care, especially with regard to cleanliness of the auricle or "flap" of the ear. If this is neglected, cracks of the skin and eczema result, which often makes the life of the little mite unbearable. The infant should also be protected from loud noises, as they tend to impair the delicate mechanism in the young ear, and shouting into the ear has been known to cause permanent deafness. Boxing the ears or pulling the lobes is a dangerous, not to say cruel, practice, and fraught with serious consequences in some cases. Children should be carefully prevented from pushing seeds, &c., into their ears, a thing they are very apt to do. All "colds in the head" are possible means of infecting the ear by way of the tube that leads into the ear from the back of the throat, and they should never be neglected. Therefore, if the baby suffers with earache a careful examination of the ear should be made to ascertain, if possible, the cause. It was at one time generally thought among the public that a discharge from the ear was in some way beneficial in diseases of the ear, and, as such, to be by no means stopped lest it be "driven into the brain." This is just the opposite of fact. A discharge from the ear is always a possible cause of inflammation of the brain, and, as such, demands skilful and thorough treatment. It should never be

neglected, and in all cases, where possible, the advice of an aural surgeon should be obtained. When a child reaches school age it is important to be certain that the hearing is normal, otherwise great injustice may be done to an innocent victim of a physical defect; and to repeat a warning, no teacher should be tolerated who boxes a child's ears or pulls them by way of punishment.

Many occupations are prejudicial to good hearing; some by the intensity of the vibrations occurring, as, for instance, "gunners" and those in which the use of high explosives is frequent, as in blasting and in boiler-making; others by reason of the dust such as millers work in. In the first it is wise to insert a piece of cotton-wool into the ear (to be removed after the explosion), and in the second very careful attention to cleanliness, or, if thought necessary, some light, easily-fitting ear-caps may be worn. Remember that ear diseases demand prompt attention if the best results from treatment are expected, and considering the importance of the matter, wherever possible, the advice of one experienced in such diseases should be sought. Above all, be very wary of the numerous and fraudulent advertisements that so constantly appear in the daily press, and which promise such wonderful results. They are traps for the unwary, who consequently suffer much disappointment often after paying considerable sums for utterly worthless articles. If help is required for deafness a careful consideration of each case is needed before any instrument is used, especially one to be placed in the ear. This can only be safely undertaken by one skilled in the treatment of diseases of the ear.

DISEASES OF THE EXTERNAL PART OR "FLAP" OF THE EAR

Eczema.—A fairly common disease of this part of the organ, especially in the weakly children of the lower classes. It may be associated with general eczema of the head, or be entirely limited to the ear. Its causes are want of cleanliness, especially of the crevices of the part, and neglect to carefully dry the skin after washing; more particularly is this the case in babies. It is also secondary to discharges from the ear. When it occurs in the acute form there is usually swelling and tenderness of the part, a crop of little blebs appear which contain a fluid which dries in crusts and stiffens linen. If *chronic*, the lobe looks dry and scurfy, and there are little cracks everywhere; it often extends some distance into the entrance to the ear, and then gives it a stuffy, uncomfortable feeling.

Treatment.—If very painful a little of the following lotion

should be carefully applied on a piece of lint : Acetate of lead, 40 grains; dilute acetic acid, 40 drops; extract of opium, 60 grains; water, one pint. Or apply a little zinc and starch powder to the affected part.

If it becomes chronic, some powdered boracic acid should be dusted on morning and night, or an ointment containing two grains of the red oxide of mercury to one ounce of vaseline applied. (*N.B.*—This ointment and others containing strong drugs like mercury should be carefully used with very young children, as they are very apt to get their fingers to it, and then lick them.)

The parts should be washed with oatmeal, as soap is very irritating and protracts the disease.

Little *blood-tumours* occur on the lobe or just inside the entrance, and are usually due to some contusion such as happens in games like Rugby football. They are unimportant, and do not often cause any trouble, therefore they should be left alone.

DISEASES OF THE ENTRANCE TO THE EAR, OR WHAT IS CALLED THE "MEATUS"

The lining skin of this canal is liable to become inflamed. Among the causes may be mentioned scratching the ear with a pin, &c., eczema extending into it from the lobe, and often the patient will date its onset to some sea-bathing, a well-known cause of the trouble.

Symptoms.—The symptoms are redness and swelling of the skin lining the canal, and a thin discharge. There is considerable pain, which is often of a throbbing character. This is increased by moving the jaw as in chewing, and also if the flap of the ear is pulled on.

Treatment.—A leech applied just in front of the ear and hot compresses are very useful in the early stages. These compresses should be made by taking two or three folds of lint and soaking them in a hot solution of boracic acid (one teaspoonful to the pint of water). They should then be wrung out, applied to the ear, and covered with a thick layer of cotton wool. Afterwards you may drop in a little of the following: Boracic acid, 10 grains; alcohol, 4 teaspoonfuls; water, 4 teaspoonfuls. These drops should be put in warm (as, indeed, should every fluid that may be applied to the ear). Cold is not only uncomfortable, it is liable to be mischievous in its effects.

We may here say that linseed-meal poultices should never be used in ear troubles; they are uncleanly and are liable to increase the discharge, especially of matter. They serve no more useful purpose

than keeping up a warm moist application to an inflamed part, and this can be done quite as well and in a safer manner in the way we have above described.

Boils just inside the ear are productive of much pain on account of the tenseness of the tissue in which they occur. Here, again, hot boracic fomentations will rapidly ripen the boil and cause its discharge. In the meantime a plug of cotton wool may be soaked in warm glycerine and laudanum (equal parts of each), and placed just over the boil. This often ensures much relief from the pain and distress. A leech just in front of the ear often gives much relief. If the bowels are obstinate a purge should be taken at bedtime, followed by a seidlitz powder on the following morning, and the general health should be attended to.

Blocking of the Ear by Cerumen or Wax is a fruitful cause of ear-trouble, and the symptoms which it produces are so annoying and uncomfortable that they are no doubt the commonest which compel many to seek advice. This cerumen or wax is a natural secretion from the external canal of the ear, and although no doubt of utility to the ear, is not absolutely essential to good hearing, as was formerly thought. The ancients believed it to be formed by the brain itself for the purpose of hearing, and fancied that it was the excess that escaped.

Symptoms.—The chief are more or less deafness, and “buzzing” noise in the ear, sometimes coming on very suddenly, and this is associated with the feeling that there is something blocking up the ear. It may cause giddiness or an “ear-cough.”

Treatment.—First of all don't use any instrument such as an ear-pick or a hairpin. All instruments are dangerous unless used with exceeding care. No one but a surgeon should ever use them, and *they* take good care only to resort to them when absolutely compelled. *The* treatment is careful syringing with warm water, to which may be added just enough bicarbonate of soda to make it feel soft. We will explain the process in detail, as it is easy for any intelligent person to safely perform it. The patient should be seated, and his neck protected with a towel. He may himself hold an empty basin under the ear and close to the skin, in order to catch the fluid as it returns from the ear. A syringe should now be filled with the soapy water (a glass syringe such as you buy for about sixpence or less will do quite well), and whilst an assistant gently pulls the lobe of the ear upwards and backwards to straighten the canal, the tip of the syringe should be placed just at the *upper* part of the entrance to the canal and the fluid injected. No undue force should be used, and the way for the return of the water kept quite clear. This may be repeated

several times until the wax has come away, after which the ear should be carefully dried with a little cotton wool, and a plug of the same material left in for a few hours. It is advisable to use a fairly large piece, and rather to fill up the fold of the ear just in front of the canal than to push it right in. In some cases the wax is so hard that there is great difficulty in getting it away. Don't use more force, but apply the following drops, *warm*, night and morning: Bicarbonate of soda, 10 grains; glycerine, 2 teaspoonfuls; water, 1 ounce. To be warmed and dropped into the ear. This will loosen the wax, and on the next attempt with the syringe it will probably come away.

It is a common practice to put *oil* into the ears for various affections, but as it is very apt to become rancid and favours the growth of "moulds" it should not be used. Many people who suffer from the excessive secretion of wax in the ear and consequent plugging affirm that they are more comfortable for a little application of oil occasionally made to the ear. In these cases we recommend instead the use of a little warm glycerine. This does not turn rancid, and its mechanical effects are the same.

Foreign Bodies in the Ear.—These most commonly occur in children who sometimes push seeds, beads, pieces of slate pencil, &c., into the ear. Such things as seeds are liable to swell from the moisture, and you had best let a doctor remove them. For the majority of these little bodies, however, the syringe is *the* method of removal. The same procedure is employed as in removing wax. One thing we must impress upon our readers is, that they must on *no account whatever* attempt to remove them with an instrument of any kind. If an instrument is to be used it must be used by a doctor only. Over and over again has irreparable damage been done, ay, and even life lost by the meddlesome use of such things as bits of wire, hairpins, &c., which the sufferer's friends are usually so anxious to employ.

Earache.—Pain in the ear is a common symptom of many of its diseases, and may arise from a lot of causes which cannot be considered here. It is by no means rare, however, for a person to complain of earache, there being nothing seriously wrong with the organ. Thus a normal ear may begin to ache, and that very frequently, after sitting in a draught, or, maybe, after getting a dash of very cold water in the ear. Another common cause is the irritation a plug of wax will suddenly set up in an ear with which nothing had been thought wrong. Sea-bathing is another cause.

Treatment.—Drop into the ear a little warm glycerine, and place a good pad of cotton wool (previously warmed) over the ear. If this

does not relieve the pain, gently syringe it with warm water and a piece of lint wrung out in hot water until it is nearly dry. Over this apply a good pad of wool. The application of heat to an aching ear is an old custom, and a common remedy in many parts of the country is to apply a warm onion to the ear. Although the relief is often attributed to some obscure action of the onion, it is of course the warmth that does the good. Warm water has been called by an enthusiast "the opium of the ear."

DISEASES OF THE MIDDLE PART OF THE EAR—THAT IS, THE PART BEHIND THE "DRUM"

Chronic Catarrh of the Ear.—This is a chronic inflammation of the lining of this part of the ear. It is not attended with any discharge. It is a condition that comes on very gradually, and perhaps for a long time a slight "singing" noise in the ear is all that is noticed; gradually deafness comes on, and increases until it is marked. A change of weather will often have a marked effect upon the condition, making the symptoms worse or otherwise. Along with the foregoing there is often a chronic catarrh of the throat and at the back of the nose. The above is probably one of the greatest causes of deafness that exists.

Causes.—It may follow upon an acute inflammation, but this is not common; as said before it usually comes on gradually. Gout, rheumatism, and syphilis are said to help in its production, and it sometimes first becomes noticeable during the extra strain that is thrown upon the system during pregnancy. Quinine, when taken in large quantities as for malaria, may also cause it.

Treatment.—Requires a specialist, if available. In the meantime a gargle of chlorate of potassium (10 grains to the ounce of water) may be used if the throat is affected, or the throat painted with tannic acid and glycerine. It is necessary to keep the "ear-tubes" at the back of the throat open, and this the patient can often do for himself by tightly closing the mouth and compressing the nostrils, and then forcibly swallowing. This is usually followed by a peculiar gurgling sensation in the ear. Alcohol and tobacco should be either omitted altogether or only used in very small quantities. As in all ear-conditions the general health must be attended to, and a good tonic to take is: Easton's syrup, 30 drops; water, one tablespoonful; three times a day after food.

Acute Inflammation in the Ear.—This very frequently extends from the back of the throat by way of the "ear-tubes." The

diseases with which it is most commonly associated are—diphtheria, scarlet fever, measles, &c., and in those in which the throat is more or less affected. Under good conditions the inflammation subsides, but unfortunately a great many cases go on to the formation of “matter,” which bursts through the “drum,” and then begins that discharge from the ear that so commonly is the sequel of the infectious fevers especially in children.

Treatment.—Rests with the doctor who is treating the case for the general condition. He will keep a sharp look-out for the earliest signs or symptoms that may point to the ear becoming affected. The nurse or mother must help in this matter by directing the doctor's attention to anything that may have suggested this in his absence. If not already in bed the patient must be sent there, a light diet given, and careful attention to the bowels. The throat, which, if it is a case of diphtheria, scarlet fever, &c., will all the while have received careful attention, must still be kept as clean as possible, and if the child be too young for a gargle about one teaspoonful of powdered boracic acid may be dissolved in warm glycerine, and this applied with a feather two or three times a day. Hot compresses (*not poultices, mind !*) should be applied, and the ear very gently syringed with warm boracic lotion (one teaspoonful of the acid to a pint of water). If a discharge appears this must be carefully and gently washed away, and cotton wool dusted with powdered boracic acid should be placed over the ear, but on no account stuffed into the hole.

Chronic discharge of “Matter” from the Ear.—As stated above, this is practically always the sequel of the acute condition. Although by no means limited to the poor, it occurs much more frequently in that class than the rich, and this principally because of the little care that is taken of the children of the lower classes when suffering, or just recovering, from fevers like measles or scarlet fever. A discharge from the ear is always a possible source of abscess of the brain, or of inflammation of the brain membranes and of inflammation in the bone at the back of the ear, with all its evil consequences. It is therefore not to be thought too lightly of, and treated with the contempt that many of its victims accord to it. How often do we see people who have a chronic ear-discharge, which has been so neglected that the lobe of the ear is perhaps covered with eczema, or even worse, of such an offensive odour as to be noticeable at some little distance.

Treatment.—Absolute cleanliness from first to last is essential. The ear should be very gently douched or syringed with warm boracic lotion night and morning, and after carefully drying it,

a little powdered boracic acid should be blown in. If the smell is offensive, instead of boracic acid alone, a mixture of 1 part iodoform to 2 parts of boracic acid may be used after each syringing.

Sometimes the discharge gets dried on the sides of the canal; then drop in a *warm* solution of 1 teaspoonful of bicarbonate of soda to a pint of water every night for a little while, and afterwards use the syringe. Of the complications of this disease no good would be done by discussing them here. They usually give evidence of their presence by severe constitutional disturbances, but if pain and redness occur behind the ear no harm can be done, and often serious trouble is averted by the timely application of a leech to the skin just over the seat of the pain.

Sufferers from this discharge should take every care of their health, and in children a teaspoonful of cod liver oil and malt taken three times a day is very beneficial. They should avoid sea-bathing altogether or wear close fitting ear-caps when doing so.

A Caution must be given as to the use of plugs of cotton wool in ear disease. As a general rule they are unnecessary and in some cases dangerous. For instance, if used in discharge from the ear they block up the natural outlet of the fluid and may do great mischief. It may be said that in only one or two cases is their use permissible, and even then only as a temporary measure; for instance, when a large gun is being fired a plug of cotton wool will protect the "drum" from too violent vibration, and "waxed" cotton wool plugs may be used for people who suffer with earache after bathing. In these cases, however, the plug should be *one* fair-sized piece of wool (small pieces are absolutely dangerous, for they are liable to be left in), and they should be at once removed after the occasion for their use is over. If the ears are carefully dried it is never necessary to use those unsightly pieces of wool that some people like, in order to "keep the ear warm." Nature has sufficiently provided that protection.

"Ringing," "bubbling," or "rushing" noises in the ear are caused by many conditions, the most frequent being an accumulation of wax pressing on the drum. They may be caused by blocking up of the ear-tubes as sometimes occurs in a "cold in the head"; and anæmia, or bloodlessness, in many patients give rise to this unpleasant sensation. It is also a common complaint of many people that they cannot take quinine, or salicylate of soda, for the very reason that it produces this "ringing in the ears." Of course there are many other causes, some of them against which all our treatment is of no avail.

Treatment.—Remove the cause if possible by syringing if due

to wax, by iron if due to anæmia, and so on. If it persists, an aural surgeon should be consulted, who will make a proper examination and treat the case. If perchance it does not improve, try not to worry about it, and by no means get into the habit of listening to it. This may seem absurd, but it is possible to acquire the habit of ignoring the unpleasant feeling that it produces. For this, of course, it is necessary to attend to the general health, change of air and scenes help wonderfully, and keeping the body and mind well occupied in a healthy and interesting vocation is perhaps the best way of all.

SECTION IV

INFECTION AND DISINFECTION

THE GERM THEORY—THE SCIENCE OF GERM LIFE (BACTERIOLOGY)—INFECTION AND DISINFECTION

It may be justly said that the *Germ Theory* in its later applications to the prevention and cure of disease has practically revolutionised the science of medicine. Previously to modern discoveries regarding germs and their nature, the exact cause of infection, and the propagation of infectious disorders, represented one of the sealed books of science. To-day, with a knowledge of germ life, and of the manner in which these microscopic organisations breed and multiply, we are able to take defensive measures against their invasion, and even to use germs themselves as antidotes to their attack. The history of the origin and discovery of the “germ theory” itself is interesting enough to warrant a brief reference being made to the circumstances under which mankind became acquainted with the fact that these microscopic living things represent the causes of many of the diseases which contribute so largely to the national mortality.

Redi's Experiments.—It was during the seventeenth century that Francesco Redi, a physician practising in Florence, initiated the idea of the germ theory in the course of a discussion respecting the origin of maggots in meat. From ancient days it had been an ordinary article of belief that maggots developed in putrefying meat through being bred by the decay of the meat itself. In other words, that which was dead and decomposing was believed to be capable of producing living creatures. Redi, taking a piece of meat, enclosed it in a vessel, the top of which was covered with gauze. The meat, as

was naturally to be expected, underwent the process of decay, and the flesh-flies, attracted by the smell of the putrefying material, hurrying to deposit their eggs in the meat, but, being prevented by the gauze, deposited their eggs on the outside of the gauze. In this situation the maggots were hatched, the process of decomposition of the meat proceeding steadily in the vessel without a single maggot appearing in the flesh. Redi was enabled through this simple experiment to show that the maggots, previously supposed to arise *de novo* from the decomposition of the flesh, in reality sprang from parent-flies. In this way he demonstrated that every living thing must be produced by a pre-existing parent, and that no form of life, however humble, could arise spontaneously from dead matter. Simple as this experiment was as regards its nature, it undoubtedly laid the foundation of all subsequent investigations, and the minds of men awoke to the fact that the law, or principle, that each living thing could only spring from a pre-existing parent-form was seen to be of universal application.

Previously to Redi's time, as we have seen, the belief that living things could be bred by decaying matter was known as the theory of *spontaneous generation*. To this theory the later term of *Abiogenesis* has been applied. In opposition to this latter term, the view that each living being, plant, or animal, high or low, is descended from a pre-existing plant or animal, is known as the theory of *Biogenesis*. It may here be impressed on the mind of the reader that the practical application of "biogenesis" is seen to-day in our more or less successful attempts to prevent the spread of infectious disease. For, if it be true that no animal or plant can arise save from a parent-form, it is equally obvious that infectious diseases, each due to the breeding and multiplication in the body of a living germ or microbe, must be similarly regarded as only capable of existence by reason of the germs which produce it having originated from parent germs preceding them. Practically applying this thought, we therefore see that every case of infectious disease is to be regarded as the offspring of a preceding case. To-day we recognise to the full that, if first cases of any infectious ailment could at once be separated from healthy persons, and kept isolated until the disease had run its course, we should be enabled in this way to prevent the development of epidemics of fever and like maladies represented by thousands of cases. The whole practice of hygiene, in respect of the prevention of infection, is founded upon the principle just detailed.

Further Researches.—Redi, as the result of his investigations, adopted an aphorism or motto, *Omne vivum ex vivo*, which, freely translated, means that all living things must be regarded as originating from parents preceding them. After Redi's time, the

microscope became perfected and revealed to science the existence of enormous fields of lower life which had been previously unsuspected. Hence the germ theory had to be reconsidered on fresh lines. A familiar experiment shows us that, if an infusion of animal or plant matter (flesh or hay for example) be made and exposed freely to the air, it will develop in course of time a huge population of germ life. When this fact was known, the question of the origin of such minute organisms in infusions became hotly debated. In one series of experiments undertaken about a hundred years after Redi's time, Needham and Buffon, using infusions of various kinds, boiled them. The flasks containing the infusions were thereafter sealed up. The process of boiling, it was held, would suffice to kill any living germs in the infusion itself, whilst the subsequent sealing was regarded as preventing any access to the infusion of living matter from the external world. As a result of these experiments, it was found that, sooner or later, infusions so treated developed abundant traces of life. Hence Needham's experiments appeared to negative Redi's conclusions, inasmuch as from the dead matter of the infusions living forms appeared to be capable of originating.

Spallanzani's Work.—The Abbe Spallanzani, a learned priest, who held the Professorship of Natural History in the University of Pavia in 1768, undertook, on his own account, a series of experiments by way of testing the conclusions of Needham and Buffon. Employing more exact methods than they did, and sealing his flasks during the boiling process by melting the glass, he showed that his infusions remained perfectly free from all traces of life. He also showed that in order to destroy any living germs originally contained in the infused matter, it was necessary to employ a higher degree of heat than that to which the infusions of his rivals had been subjected. By way of a test experiment, Spallanzani, breaking the necks of his flasks, and allowing the air freely to enter them, showed that abundant traces of life soon appeared in the fluids. He expressed the opinion that infection of his infusions could thus only have occurred from particles gaining access to them from the air. He himself styled these particles "germs," and we may, therefore, regard Spallanzani, following in the footsteps of Redi, as the real originator of the germ theory. Subsequent experiments, conducted practically from the middle of the nineteenth century onwards to our own day, have served to confirm the views of the learned priest. Thus it was found in 1836 and 1837 that an infusion, liable to develop life, could be protected from the outside air by certain chemical substances. Air, in other words, was allowed to gain admittance to the infusion, but only after it had passed through

the substances in question. The result was negative in so far as the development of life was concerned. It was, however, objected to these experiments, that the composition of the air might have been altered by the chemical substances used. Hence investigation was undertaken on other and different lines. In 1854 and 1859 experiments were made, which obviated the objections to which allusion has just been made. The flasks, after having had their infusions sterilised by boiling, had their openings plugged with cotton wool. Thus treated, they remained perfectly free from any development of life. Air gained access to the infusions, but the cotton wool formed an effective screen or filter which kept back any microbes from entering the fluid. It was thus proved that the real cause of infusions developing traces of life resided in a material something which was to be found in the air. It was reserved for the brilliant researches of Tyndall and Pasteur to show that, as Tyndall himself expressed it, the air might be described as a "stir-about" of microbes or germs. He demonstrated that ordinary air is practically clouded with dust particles. Many of these are of mineral nature. Some consist of vegetable *debris*, whilst a certain proportion of the floating dust of the air consists of the microscopic "spores" (or seeds) of moulds, fungi, and the like, and also of microbes or germs, some of which, at least, are to be regarded as of disease-producing nature.

The Demonstration.—The long course of experimentation, thus briefly detailed, has placed *the germ theory of disease* on a satisfactory basis. It constitutes the only explanation of the manner in which infectious ailments are propagated from a diseased body to a healthy person, whilst it must not be forgotten that the essence of the theory depends on the principle enunciated by Redi that the only possible source of life is pre-existing life. As any infectious disorder owes its existence to a germ or microbe (which is a living thing) we reach the conclusion *that any case of infectious trouble can only arise from its living germs having been received by the patient from a previous case of the disease.* In other words, no case of fever or other infectious ailment can spring up of itself without the pre-existence of its germs. It is this principle, we may repeat, which governs and regulates the whole sanitary service of every civilised nation. We, therefore, decide that each case of, say, scarlet fever or smallpox must have its origin in a preceding case. So, also, typhoid fever can no more spring into existence without the presence of its germs, derived from a case of the disease, than maggots or youthful flies could appear in decaying meat without the existence of parent insects.

Fermentation.—An instructive parallel may be drawn by way of illustrating the nature of infection between the action of *fermentation* and the invasion of the living body by disease germs. By *fermentation* we indicate that common action whereby alcohol is produced. This action is the result of the work of a microscopic plant. The common *yeast plant* (Fig. 25) is represented by a single living cell which possesses the power of budding and of actively reproducing its kind. When, in the processes of the brewer and the baker, yeast is added to any substance containing sugar, it exercises its living functions and splits the sugar into *carbonic acid gas* and *alcohol*. The brewer retains the latter, which constitutes the essential element of his beer. The baker, on the other hand, uses yeast to raise his dough by means of the carbonic acid gas, such alcohol as is produced, being driven off by the subsequent process of baking. Here we see the action of what is called a *living ferment*. The production of alcohol and of carbonic acid gas is due to the special work of the yeast plants which the brewer and baker respectively use. The scriptural phrase regarding the little leaven which leavens the whole lump, is accurately illustrated by the action of the yeast plant. For when a small portion of yeast only is used, at the close of fermentation we find an enormously increased number of yeast plants present. In the souring or spoiling of wine, on the other hand, which practically results in the conversion of the alcohol into vinegar, we find another species of fungus concerned; so that each description of yeast plant, so to speak, has its own soil, in which alone it can develop and exert its particular action.

The Parallel Case.—When a living body is infected with the germs of disease we perceive the close parallel which exists between infection and the process of fermentation just described. A few germs are received by the body, being inhaled or swallowed, or otherwise gaining admittance to the system. During a certain period (called the *period of incubation*, already noted in the section of this work dealing with Fevers, vol. i.) the germs undergo a period of development. They breed and multiply in the body. When this development has reached its height the active symptoms of the ailment appear just as in the process of fermentation, the full action of the production of alcohol is only possible through the extreme development of the yeast plants themselves. It is here, as if what may be called the little leaven of disease, operates to leaven the whole lump of the body.

Germs, Harmful and Harmless.—An important point for consideration in connection with the germ theory of disease is that which reminds us that all microbes or germs are not necessarily disease-producing or of *pathogenic nature*. Many forms of germ

life are serviceable to man. In what is known as the *bacterial treatment of sewage*, for example, we find the natural action of certain germs utilised so as to dispose of the solids of sewage in a harmless fashion, leaving a perfectly clear and pure effluent in the shape of water. Again, it has been fairly well demonstrated that the action of certain germs contained in the digestive system is essential for the due carrying out of digestive work. It is also to be noted that ordinary processes of decay and decomposition, removing from the earth's surface matters which would be otherwise offensive, are carried out through germ agency. Beyond these actions, however, we have to take into account those more immediately affecting the health of man in the shape of disease-producing microbes. In previous sections of this work (vol. i.) reference has been made in connection with specific ailments to the germs which are directly responsible for the diseases in question. In a very considerable number of the ailments which affect the body special germs have been discovered and described. It is sufficient here to note that we are perfectly acquainted, for example, with the microbes which cause cholera, typhoid fever, diphtheria, dysentery, lock-jaw, and malaria, various forms of blood-poisoning (including *suppuration*), tuberculosis, and the like. In such a disease also as gonorrhœa a specific germ is also found, the infective nature of this ailment being due to the conveyance of the germ from an infected person to a healthy body. In the case of other ailments bacteriology has not yet succeeded in isolating the particular microbes to which they owe their origin. Thus we are yet unaware of the particular germ to which we owe scarlet fever, nor has the microbe of smallpox been satisfactorily demonstrated. The same fact holds true of hydrophobia in man and rabies in the dog (vol. i.), though it is contended by some authorities that a microbe of rabies has been described. It cannot, however, be doubted that the further advance of science will have the effect of demonstrating the exact microbe to which each infectious disease owes its origin. Where, however, the particular germ of an ailment has not been discovered, the circumstances which attend its attack and its mode of propagation are more than sufficient to warrant us in believing in its germ origin. In the case of scarlet fever, for example, no reasonable doubt can be entertained that this ailment is propagated through the conveyance of its germs from the sick to the healthy. Every feature of the ailment shows clearly enough its origin as the work of a microbe. Of cancer the same opinion may be expressed. The theories regarding the origin of this ailment have already been detailed in the section of this work devoted to the consideration of the disease in question (vol. i.). Cancer may arise from

another than a germ source, but, at the same time, it may be said that the idea of its origin from a special microbe is one which finds much favour in the eyes of many authorities.

INFECTION

The practical outcome of the science of germ-life is that which leads directly to the consideration of *modes of infection*. This latter process is one often extremely difficult to trace. It can be readily understood that, depending as does infection on microscopic forms of life, existing practically as dust everywhere, the opportunities for microbes reaching the living body are many and varied. We have also to consider the fact that germs are capable of retaining their vitality through long periods of time. Hence existing in what may be called a latent state, it may be for years, such germs may wake up into activity and prove capable of producing disease when favourable circumstances are presented. It is of importance to recognise that the principle of "the soil and the seed" must be taken into account in all considerations connected with infection. The parable of the sower finds a practical illustration in modern germ science. The seed develops according to the soil in which it finds itself placed. It is much the same with the germs of disease. If they find in a living body a suitable soil, they develop and grow. If, on the other hand, the body (or soil) is unadapted for them, they perish. Such an idea explains to us why, if we are encompassed with multitudes of disease germs, we are not continually attacked. The healthy body undoubtedly possesses many means of resisting germ attack. In the first place, most of the fluids of the body, and especially the blood in a state of health, possess germ-killing powers, and the work of the white blood corpuscles (described in vol. i., p. 91) in seizing and destroying microbes has also to be taken into account as one of the defensive measures of the living body, not merely in man, but in lower animals as well. It is also highly probable that many of the secretions of the body, represented by those of the nose, the air tubes of the lungs, and the secretions of the digestive system and spleen exert germicidal actions. It is, for example, known that the acidity of the gastric juice of the stomach exercises a destructive action on the germs of cholera. If we suppose that this acidity from one cause or another is lessened, we may regard infection as much more likely to occur.

Modes of Infection.—Whilst many infectious diseases exhibit common modes of infection, we find others again to represent specific methods of attack. Thus, in the case of smallpox, germs are con-

veyed from the bodies of patients by the air, a fact sufficiently proved by the circumstance that infection of this air-borne character is much more likely to occur in the vicinity of the smallpox hospitals than at a greater distance from them. Such a fact was duly noted in the case of Fulham hospital, London, by Mr. Power, and in that of smallpox hospital ships moored in the Thames; infection being conveyed to the Essex coast in the direction of prevailing winds. Of scarlet fever the same remarks hold good, and both in smallpox and in the last-named disease, personal contact with the patient is capable of conveying infection. The skin scales given off from a scarlet fever patient thus form a notable source of infection when conveyed by air or through infected milk. It is now known that typhoid germs may also be contained in the urine of patients, so that the attention of nurses is duly directed to the disinfection, not only of the bowel-discharges, but of the urine as well. In the case of cholera and typhoid fever, these diseases are not usually considered as "infectious," in the same sense in which, say, smallpox or scarlet fever are so designated. At the same time there is a growing opinion to the effect that, unless efficient disinfection of bed and body linen of patients is practised, any portions of the bowel discharges contained thereon may be liable to convey the disease.

The word "contagious" has been applied to indicate those diseases which are liable to be conveyed by personal contact with patients but it seems desirable to do away with the use of this word, inasmuch as all "contagious" diseases must be "infectious" in nature. The fact that scarlet fever can be carried directly from the sick body to a healthy person (*contagious*) and that it is "infectious" in the sense that its germs can be carried in milk, serves to show that there is no need to employ two terms when the simple words "infection" or "infectious" serve all purposes.

Direct Infection.—This process is common enough in the case of certain diseases. Contact with the discharge, as has been explained in the case of gonorrhœa, sufficiently accounts for infection in this disorder, as in the same way a wound can be infected with the germs of tetanus or lock-jaw only through their gaining admittance directly into the wound. The bite of a rabid dog in the same way infects the body directly through the conveyance of the poisonous material into the blood, and the same opinion may be expressed of any other poisoned wound represented by the sting of an insect or the bite of a poisonous snake.

Indirect Infection.—We thus note that infection may either occur *directly* in the sense just expressed, or may take place *indirectly* through the conveyance of germs to us in air, water, or

food. An oyster taken from a bed over which water, from a town, containing sewage and typhoid germs is allowed to pass, will convey disease in this way through food, just as a milkman, careless of the purity of the water he uses for the cleansing of his vessels, or a farmer equally negligent of a case of diphtheria or scarlet fever occurring on his premises, is liable to propagate these ailments through infection of the milk supplied to the public. With regard to the vitality of disease germs, it may be added that cases of scarlet fever have been known to originate in children playing with the toys of others who perished of the disease years before. Such toys were carefully kept, and, being used by children subsequently, produced the ailment. In the case of scarlet fever also it is well known that this disease can be conveyed by letters, a point easily explained when we have regard to the fact that in the skin scales of the patient, as has already been remarked, the germs are contained, such scales in the form of invisible dust readily passing from the hands of a patient into the letter he writes.

Protection against Infection.—It has already been explained that the healthy body possesses natural means of checking risks of infection. In other words it exhibits natural resistant powers or qualities against attack. It is well known that one attack of certain infectious diseases protects against a subsequent attack, although this rule shows exceptions. If it be asked on what principle the protective effect of a first attack of a fever can be explained, we find three views or theories advanced by way of accounting for the circumstance in question. The first of these views is named the *exhaustion* theory.

Here it is believed that the work of the germs in the affected body removes or exhausts some particular substance or other forming a suitable soil for their development. In the absence of this particular substance they cannot again successfully invade the frame. The second opinion is termed the *antidote* theory. It maintains that, as the result of a first attack, some substance or other is produced in the body which prevents the second invasion. It is as if the bane, in the shape of the germ, provided its own antidote. In connection with this view of matters, it must not be forgotten that the *serum treatment of disease* is founded upon a practical application of this theory as described in the section (vol. i.) dealing with diphtheria. We find that the germs of this disease used to inoculate the blood of the horse, develop what is called an *antitoxin*. This substance used in the case of a human patient cures the disease, and similar serums are now employed in the case of other ailments, such as typhoid fever, cholera, and lock-jaw. One view of the termination of a fever indeed takes as its standpoint the idea that

when the germs have reached the height of their development they perish on account of their own production of an antitoxin. The third theory accounting for the protection conferred by a first attack against a second maintains *the modification or alteration of the cells or tissues* of the affected body so that subsequent infection is prevented. In connection with this latter view, we have to take into account the action of the white blood corpuscles already alluded to (vol. i.) in serving as destroyers of microbes. A first attack of the disease on this theory would be credited with reinforcing the corpuscles to resist a second attack.

GERMS AND THEIR HISTORY

[See also Plate illustrating Germ-Life.]

The classification of microbes or germs, otherwise known as *micro-organisms*, is a matter of technical nature. The main outlines, however, of a simple arrangement may be easily comprehended. Regarding *microbes* generally, they may be said to exhibit a division into what may be termed certain family groups. The first of these groups is that which includes the various kinds of *bacteria*. The body in this group is generally

of oval shape, or may be rod-like. Bacteria possess a *cilium* or a lash-like filament at one or both ends, by means of which they are able to move rapidly through the medium in which they are contained. Bacteria are usually *aërobic*; that is, the presence of oxygen is required for their full activity and develop-

ment. Some species, on the other hand, are not, and are called *anaërobic*. The second family group is that of the *bacilli* (Fig. 23). These are rod-shaped germs, the ends of which may either be rounded or sharply defined. Certain of them possess *cilia*, whilst others want these processes. They also appear to demand, as a rule, the presence of oxygen for their development. Bacilli are represented in such diseases as diphtheria, typhoid fever (Fig. 27), tuberculosis, lock-jaw (Fig. 26), pneumonia (or inflammation of the lungs), and many other ailments. That of cholera exhibits a bent shape, and is hence known as the *comma-bacillus*. In the matter of their growth

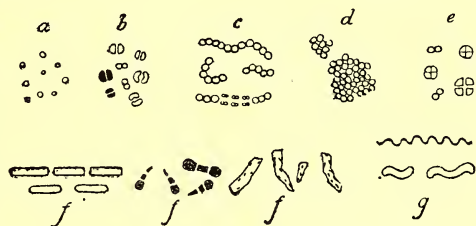


FIG. 23.—Forms of Germs.

a, Cocci; b, Diplococci; c, Streptococci; d, Tetrads; f, f, f, Bacilli; g, Spirilla.

bacilli tend to grow longer, dividing in time into new germs, whilst they also form *spores* (or seeds), which grow in the inside of the germs, and ultimately are liberated by the rupture of the parent germ, each spore becoming a separate bacillus. In the case of the spores themselves, in many cases also, they are seen to exhibit a projection at one extremity, this projection becoming in its turn a new germ. These processes of reproduction may take place with great rapidity, millions of new microbes under certain circumstances being produced in a few hours.

The third family of germs includes forms known as *spirilla* (Fig. 23). Here we meet with microbes of spiral or corkscrew shape, one of the most typical of these germs being found in the disease known as relapsing fever. A fourth family of microbes is known as that of the *micrococci*, which are often classified as bacterial species (Fig. 23).

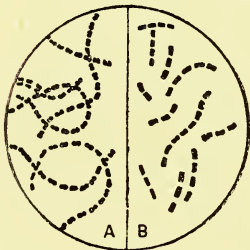


FIG. 24.—A, *Streptococcus pyogenes* (chains); B *Bacillus of Anthrax*.



FIG. 25.—Yeast.



FIG. 26.—Tetanus Bacillus.

These appear as rounded microbes, and multiply by various modes of division. Thus we find them appearing as pairs of germs, or as chains, whilst occasionally they may be found to form square-shaped groups of four (Fig. 23, *d*) germs, or of a larger number represented by a multiple of four. Occasionally also *micrococci* may appear in the form of masses of germs embedded in a jelly-like substance. These latter germs are found in cases of suppuration where "matter" is developed, and also in erysipelas, whilst they are also seen in the case of the lymph used for vaccination, and also in smallpox. It is necessary to add that certain organisms, not specially ranked with the preceding groups of disease germs, have the power of causing ailments. "Thrush," marked by the development of white patches in the mouths of infants, is due to the growth of a special kind of fungus allied to the yeast plant itself. Other microscopic fungi are responsible for skin diseases, amongst which ringworm is conspicuous. Those microbes which can grow in surroundings destitute of oxygen are called *anaerobic*. Common yeast (Fig. 25) is an example of such a microbe. It derives its oxygen from the sugar it converts into alcohol. On the other hand,

the fungus, which sours wine and turns it into vinegar, is called an *aerobic* microbe. As a rule it is found that those microbes which demand oxygen grow most luxuriantly at the top of the free surface of a liquid, whereas those which do not require oxygen grow in the deeper layers. In the case of the bacillus of lock-jaw (Fig. 26) we find that it grows, or multiplies, in the deeper parts of a wound where there is little oxygen. In this situation it produces its particular poison, which, when it passes to the nerve centres, produces the characteristic symptoms of the disease. In the case of the microbe of lock-jaw we find a bacillus which is elongated in shape and capable of movement. It also exhibits the feature, already noted as common to certain germs, in that it develops a spore at one extremity, and thus develops a somewhat drumstick form. It must be borne in mind that certain organisms capable of causing disease belong to the animal

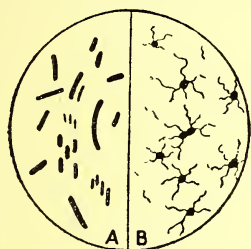


FIG. 27. —Typhoid Bacillus

A, Non-flagellated.
B, Flagellated.

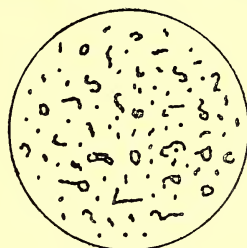


FIG. 28. —Bacillus Coli Communis.

world. The microbes we have been considering are usually regarded as the lowest members of the plant kingdom, some authors regarding them as intermediate between the lowest animals and the lowest plants; but it has been discovered in cases of dysentery and malaria that the specific germ belongs to the lower orders of animal life, and resembles in its character the amoeba (vol. i. p. 79), one of the lowest forms of animal life.

Microbe-Variation.—It is notable that microbes, like other living beings, exhibit variations in development, and thus illustrate the influence of the great principle of evolution, which is accountable for producing the variations so characteristic of living nature at large. A familiar example of this fact is seen in the case of the bacillus of typhoid fever (Fig. 27). Under ordinary circumstances these appear as short rods, with rounded ends. Under cultivation, the typhoid bacilli develop lash-like processes known as *flagella* (Fig. 27, B). Here it appears we meet with a variation due to a difference of surroundings. If we have regard to the broad question of the evolution and origin of disease germs at large, we may reasonably hold that, as these lowest forms of

life must have been in existence long before man appeared at the scene, they then found a suitable soil for growth, as do many microbes to-day in water, soil, or other surroundings. When they acquired the habit of infecting the bodies of men and lower animals, we may regard this alteration of environment as having developed disease-producing powers. To-day we know of microbes which, in one phase of their lives, are harmless, but when transported to the animal body become disease-producing. It is also more than possible that certain microbes, ordinarily of a harmless character, may, through alteration of their environment, become disease-producing. Such a view is supported, to a certain extent, although not absolutely confirmed, by the case of a certain germ, known as the *bacillus coli communis* (Fig. 28). This germ is a natural tenant of the human intestine, and is found in all persons as well as in the bowels of certain lower animals. In the case of certain diseases this bacillus often occurs, although the part played by it in the production of such ailments is uncertain. The opinion has been expressed that, under the influence of a different environment to that which it finds in the healthy bowel, where it exercises no disease-producing powers, it may develop such qualities. Transference of this harmless germ, say to sewage or putrefying matter, is believed by some authorities to be capable of converting it into the germ of typhoid fever itself, to which it possesses a certain resemblance. It is probable that future research in the matter of germ science will tend to show that variations in the conditions, under which microbes grow and multiply, may demonstrate the common origin of many of those germs, each of which is at present regarded as a distinct species.

DISINFECTION—THE PREVENTION OF INFECTIOUS DISEASES

It has already been shown that disease prevention, in so far as infectious disorders are concerned, is a work in the course of which two distinct elements are concerned. The first of these principles is that which shows *the high importance of at once isolating and separating first cases of infectious disorders*, and of thus preventing the spread of infection to surrounding persons. The second principle is known as that of *disinfection*, whereby another feature of security is represented, inasmuch as, if the germs of any particular disease are capable of being destroyed, as they escape from the body of the patient, a very important source of infection can thus be avoided.

A Caution to Mothers.—It is necessary here to make refer-

ence to an only too common practice, represented in the life of the masses of the nation. The people at large have been impressed with the idea that children, for example, require to pass through a whole series of epidemic disorders ranging from scarlet fever to mumps, and that no possible means of prevention of attack are capable of being brought into practice. It is no uncommon thing to find that, in the case of, say, a working-class family inhabiting a house whose accommodation is by no means adapted for the treatment of infectious disease, where one child sickens, say from measles or scarlet fever, the other children are allowed to be infected from the first case. The idea of this most reprehensible practice is that which is founded on the belief that all children are bound to suffer from such disorders, and, therefore, where a chance of infection occurs, it is better to treat all the cases at one time than to have the care of separate cases occurring at intervals. It need hardly be said that it is a rule equally of hygienic science and of ordinary morality, that no disease, simple or complex in character, should be conveyed wilfully and knowingly from the sick to the healthy. In cases where a mother, acting on the worst of advice, has exposed her children to the infection, say, of scarlet fever, whilst the first case may probably have been of mild character, the succeeding cases have proved malignant and fatal. Under a mistaken idea that, by having all the children ill at once, a few troubles may be avoided, the parents have often had to experience life-long regrets on account of the deaths of their children, who have thus been wilfully infected with disease. We should, therefore, bear clearly in mind that under no circumstances whatever, is it justifiable to infect any healthy body with any disorder.

Notification of Infectious Diseases.—Impressed with the idea that infectious diseases can be controlled as regards their spread, the sanitary legislation of the country has inaugurated a system which enables medical officers of health to locate the presence in any given district of cases of infectious disorder. This principle is known as that of *the notification of infectious diseases*. It must be perfectly clear that where the public authorities can gain early information of the occurrence of any infectious outbreak, they are thereby enabled to take such cases at an early stage under their care, and to limit infection spreading far afield from the original source of the disease. In ordinary cases the duty of notifying the presence of an infectious disease is laid upon the shoulders of the head of the house in which the case occurs. Having regard to the fact that in all well-regulated communities a medical officer of health superintends the interests of the public, and is assisted by a staff of sanitary

inspectors, we readily note how the co-operation of the public is essential and necessary for the limitation of the spread of any infectious ailment. In most districts also we find special hospitals provided for the treatment of epidemic diseases. Notification of disease by the householder, therefore, implies instant action on the part of sanitary authorities. A patient can be quickly conveyed to a hospital of the description named, and, with subsequent disinfection of the premises in which the patient lived, and also by observation being kept upon those who may have been exposed to infection, a first case or cases of smallpox, scarlet fever, or other infectious malady, may be prevented from giving origin to hundreds of cases. It is most desirable that the public should be duly educated with regard to this principle of the notification of disease, inasmuch as only by the efficient carrying out of this work can the safety of the greater number from infection thereby be secured.

Fever Treatment at Home and in Hospital.—As society is to-day constituted we may well express the belief that no case of infectious disease should be treated in the home. Public feeling is gradually being educated up to the reception of the truth of the axiom, that the proper place for the treatment of all fevers is the hospital, public or private as the case may be. Not merely do we find more adequate medical supervision and nursing in the hospital ward, but we have also to take into account the fact that medical aid is also permanently represented in the shape of the hospital staff and the spread of infection duly prevented.

Home Treatment of Fever.—Supposing, however, that a case of infectious disease has to be treated in a private house, certain definite rules require to be observed in connection with the care of the patient, and also with regard to the prevention of infection in the case of other members of the household. The room chosen for the patient should be one on the upper floor of the house. The reason for this selection is that it is unlikely that infection will spread. The upper direction of air in the house might entail a risk of disease to other members of the house if the patient were treated in a room situated on the ground floor, or that above it. With regard to the arrangement of the room in which the patient is treated, we may shortly sum up the arrangements by stating that it should be converted as nearly as possible into the condition of a hospital ward containing one patient. Thus all carpets and bed-hangings must be removed from the apartment; free ventilation of the room must be secured; and the chairs in the room should be of wood, and not of any material likely to harbour and retain germs. Outside the door of the sick-room a sheet should be suspended, this sheet being kept saturated with some

disinfectant, such as a solution of carbolic acid, or, better still, of Izal. The object of this latter precaution is that of securing that the opening of the door, guarded by the sheet, does not permit of the escape of fever germs into the house.

Some Sick-Room Precautions.—A very important caution in the treatment of fever cases at home is that which ensures that spoons, cups, or other vessels used for the nourishment of the patient should be kept in the room and cleansed therein by the nurse. One can readily understand that in the case, say, of scarlet fever or diphtheria, vessels which have been used by the patient, or even spoons, would be liable to convey infection if, taken to other parts of the house, they were used in mistake by healthy persons. Even a handkerchief used to wipe the mouth of a patient and carelessly treated thereafter by being placed in the soiled linen-basket common to the family, might convey infection to the family itself, or to a laundry. Hence it is that the trained nurse dealing with a fever case invariably uses pieces of rag to wipe the mouth and nose of the patient, such rags being at once burned and destroyed.

Disinfection.—Naturally, each case of infectious disease exhibits its own special phases of disinfection, according to the nature of the ailment. Thus, in the case of cholera, or typhoid fever, the nurse will pay special heed to the disinfection of the bowel-discharges, seeing that infection is most liable to be conveyed from that source; whilst the urine of the typhoid patient will also be duly treated, so as to render the germs it contains incapable of conveying the disease to others. Where diphtheria, or scarlet fever, forms the subject of attention, the secretions of the mouth and the throat demand special notice. In scarlet fever, as in smallpox, the skin forms a source of infection. Hence it is proper, in such diseases, to apply to the skin disinfectant materials, which generally take the form of carbolic oil or Izal ointment, by way of preventing the escape into the air of the dry skin scales, which are known to convey infection in either case. Even *the dress of the nurse*, in a case of infectious disease, forms by no means an unimportant item. The typical fabric for a nurse's dress is linen. This fabric does not harbour germs, as is the case with heavier materials of the nature of wool.

Personal disinfection of the patient is not limited to the case of the skin, but also extends to the care of bed and body linen, when these items demand changing. No article of clothing liable to be infected should ever be allowed to pass out of a sick-room without being properly disinfected, inasmuch as carelessness in this respect tends powerfully to the diffusion of the disease, not merely in the household, but in the case of a laundry, to which such clothes may

be sent. When bed and body clothes are removed from a patient they should at once be plunged into a galvanised iron tub, in which has been prepared a disinfectant solution typically represented by two ounces or so of Izal to the gallon of water. In this solution the clothes taken out of the sick-room should be allowed to soak for at least twelve hours. They may then be safely treated in the laundry in the ordinary way. With regard to the sheet, already mentioned as hanging outside the door of the sick-room, in which a case of infectious disease is being treated, an ingenious proposal has been made to the effect that on the top of the door, a narrow zinc or tin receptacle should be placed. Through a slit in the bottom of this receptacle, the upper end of the sheet is drawn, the receptacle itself being filled with a solution of Izal of the kind already indicated. This solution passes downwards to the sheet by capillary attraction, and saves trouble on the part of the nurse in the case of the ordinary sheet, seeing that she has, at intervals, to saturate it with a disinfectant solution by pouring such solution upon it.

Infection Details.—In the section of this work dealing with fevers, mention has been duly made of the period, not merely of the incubation period or development of such diseases, but also of the period of infectivity, or that during which the patient is liable to convey the disease to others. Nothing need, therefore, be said here regarding these important topics, but it is highly advisable that, if any infectious disorder has to be treated in a private house, those in charge of the case should strictly attend to the times and limits under which the patient should not be permitted to mix with healthy people. With respect to certain diseases, it may be said that infection is possible from the time when the patient is seized. This is probably true of such a disease as scarlet fever and diphtheria. The safe rule for the public in this case is that of practically regarding every fever case as infectious from its commencement, and of strictly attending to the period (duly noted in a table in the section on Fevers, vol. i.) during which infection is liable to occur.

DISINFECTION AND DISINFECTANTS

It is somewhat unfortunate that the term *disinfectant* has come into universal use in the English language. *The reason for this opinion is found in the fact that the public are apt to regard as "disinfectants" substances which do not possess the power of perfectly destroying disease germs.* If the term *germicide* could be substituted for the term "disinfectant," a more satisfactory state of

matters might be attained. A "germicide," as the name indicates, is a substance which kills microbes. A "disinfectant," on the other hand, may or may not effect this purpose. Thus certain substances, regarded by the public as destructive of disease germs, have no power whatever of effecting such an action; they merely scotch, but do not kill microbes. Hence if we rely upon such substances to dispose of disease germs and expose ourselves thereafter to risk of infection, we can realise the truth of the statement that bad disinfection is worse than none at all. If we know that no disinfecting measures have been carried out, we can then realise the nature of the risks we run, whereas, when an inefficient disinfectant has been employed, we come face to face with unknown dangers.

Every true disinfectant must, therefore, be regarded as a "germicide"—that is, an efficient killer of microbes. What are known as *deodorants* practically represent substances which cover a disagreeable odour by another and more agreeable one. The spraying of a sick-room with scent, or some similar solution, represents the action of a "deodorant," which, it need hardly be remarked, has no effect whatever in killing any disease-producing microbes present in the atmosphere. A second class of substances liable to be confused with true disinfectants is that known as *antiseptics*. An "antiseptic" may be defined as a substance which has the power of arresting the growth of microbes without necessarily destroying them. Flour-paste speedily becomes rancid and exhibits a high development of microbic life, especially when kept in a hot room. If, however, a few drops of carbolic acid solution be added to the paste, it will preserve its pure character for a certain period. When the effect of the acid application has passed away, the souring of the paste will proceed as before. Here no true process of disinfection has been carried out, but only a temporary or "antiseptic" measure. These cautions are extremely important, inasmuch as we note that it is the absolute destruction of the germs of disease contained in clothing, water, food, and other media, which is the distinguishing aim of all true disinfecting processes.

A Disinfecting Error.—By way of illustrating a public misconception with regard to disinfection, no better example can be cited than the common practice of placing saucers or other vessels containing disinfectant solutions in a house in which a case of infectious disease is being treated. Such solutions give off to the atmosphere extremely small quantities of disinfectant vapour. The idea of employing a disinfectant in this way, is that of ridding the air of any microbes it may contain. Considering that, to destroy disease germs, any disinfectant must not merely come closely in

contact with them, but be employed in a fluid solution (as in the case of infected clothes), we can readily see the futility of supposing that a minute amount of the vapour of carbolic acid, or other disinfectant, passing into the air can rid the atmosphere of any germs at all. This represents a case in which a very false idea of safety is conveyed by a common and useless practice. One might go the length of saying that if the air of a house had to be disinfected so thoroughly as to rid it of all disease germs, it would become fatal to those who breathed it. Again, many disinfectants are used which give off no vapour to the air at all, and must therefore be useless for such a mode of disinfection. We thus arrive at the just conclusion *that attempted and futile disinfection of the air is of no avail whatever as a preventive of the spread of disease*. The only practice which can possibly be effective at all, is that which includes the principles, first, of using *a proper disinfectant*, and second, of *applying it directly to the disease material*, whether this latter be represented in the case of the bowel discharges of a typhoid fever patient, or to the skin of a person suffering from scarlet fever or smallpox. This idea is equally well represented by the practice, already alluded to, of disinfecting the bed and body clothes of fever patients.

Disinfectants.—The list of germicides, or disinfectants, is extremely long and varied. These substances may be divided into two classes, namely, disinfectants represented by *heat* and *cold*, and by those of *chemical nature*.

The extremes of heat and cold vary very greatly in respect of their effects on germ life. It may be said that the highest degrees of cold which have yet been attained have been found to be ineffective in the work of destroying microbes. Cold, as represented in processes applied to the preservation of meat, probably acts as an antiseptic agent only. In an allied fashion foods are preserved in hermetically sealed tins, and so long as the external air is prevented from gaining access to the food it remains unaffected. In refrigerators, where the food is kept at a low temperature by means of ice-cooled air, decomposition is arrested. Whenever air, containing its multitudes of microbes, is admitted to such foods, the processes of putrefaction at once commence.

Heat as a Disinfectant.—It is very different in the case of *heat*. This is one of the most powerful and efficient germicides known. It is represented, first of all, in a familiar way by the destruction by actual burning of rags, handkerchiefs, or other infected materials. On the other hand, heat may be applied to disinfected clothes and other objects, so as to remove microbes from them, at the same time avoiding the destruction of the

materials. Two forms of heat have been employed in the work of disinfection. It is known, for example, that superheated steam—that is to say moist heat, of a high temperature—has much more effect as a disinfectant than hot dry air. Disinfecting ovens, where dry heat is employed, have been proved to be ineffective in respect of the destruction of microbes, unless the heat be maintained for a very considerable period. The highest degree of heat thus obtainable is about 220° F., and even when exposed to this high temperature, ordinary disease germs are not destroyed, unless within a period varying from eight to ten hours. On the other hand, even the most resistant germs have been found to be destroyed by being subjected to the action of steam at a temperature of 213° F. from five to ten minutes. On this account, superheated steam, applied under pressure, is now universally used in public disinfectors, in which the clothing of fever patients is treated. One of the best known disinfectors of this type is that of Washington Lyon. Here we find an apparatus which exhibits a pressure of steam of 30 lbs. per square inch, with a temperature of 273° F. in the outer chamber, or steam-jacket, which is first treated. This causes the temperature of the inner chamber to increase, by way of preventing any condensation of steam, which it receives later. Steam is then turned on into the inner chamber, and is maintained at a high temperature for a certain time. In the next instance the steam is turned off from the inner chamber, but is still maintained in the outer apartment or jacket, with the result that the articles undergoing disinfection are thoroughly dried, and can then be withdrawn perfectly purified. In this way, through the action of superheated steam, disinfection of various articles is secured in a period varying from ten to twenty minutes. In another form of disinfecter of this kind, invented by Dr. Thresh, steam, at ordinary pressure of a temperature of 212° F., is employed. The chamber in which infected clothes are placed is surrounded by an outer jacket containing water and salines, the temperature being here raised to 225° F. The advantage of the Thresh disinfecter appears to be the ready attaining of a high temperature, which, in an hour or less, effectively disposes of all microbes. Means exist, as has been indicated, for the effective drying of articles subjected to this process, and, in the case of the poor, to whom the saving of blankets, mattresses, and other articles is a consideration, the institution by sanitary authorities of such disinfectors must be regarded as an immense boon, not merely from the point of view of economy, but also from that of efficient disinfection. It will thus be understood that superheated steam is vastly superior to hot air as a disinfecting agent. In the case of hot air, a tendency

exists whereby articles are scotched or destroyed, whilst a much more important objection is that which is founded on the fact that the heat penetrates very slowly, and, in the case of thick objects, such as mattresses, may leave certain portions of them untreated. In the course of certain experiments made by way of showing the relative values of hot dry air and superheated steam, as disinfecting measures, it was found that the temperature rises in the inner of woollen objects very slowly, whereas, when steam apparatus was employed with the same objects, the requisite temperature for destroying germs was attained in about seventeen minutes. The universal use by municipalities of steam disinfectors most undoubtedly tends to the prevention of much infectious disease, through bedding, clothing, and other articles of the poor, as has been described, being purified free of charge. In the course of steam disinfection, leather articles tend to shrivel, the effect of hot dry air making such articles brittle. On the other hand, whilst cotton and silk articles are injured by the action of dry heat, they are not so affected by steam. Woollens do not appear to be injured by either process, and their colours, as a rule, come out uninjured.

Chemical Disinfectants.—The preceding remarks have reference to those processes of disinfection which are practised by corporations for the safety and protection of the people at large. In the case, however, of private individuals reliance is placed upon the use of chemical substances which are more or less effective for the destruction of disease germs. It is obvious that in the case of a private dwelling the service of a steam apparatus is of no avail. Hence there has grown up a belief on the part of the public that certain chemicals may be efficiently used for the purpose of destroying microbes. The remarks previously made concerning the advisability of strictly determining the nature and efficiency of any substance used as a disinfectant must be clearly borne in mind in the present instance. At the outset, it is necessary to remark that so-called chemical disinfectants vary materially in their powers of microbic destruction. Some are highly effective; others exhibit medium power of disposing of microbes; whilst a third class may be regarded as utterly inefficient and useless as means adopted with the prevention of the spread of infection. Certain substances may, indeed, be placed entirely outside the category of true disinfectants. We have already seen the utter uselessness of exposing any saucers or other vessels containing a certain quantity of disinfectant mixed with water under the idea that the minute quantity of vapour given off therefrom, can possibly affect the microbes of the air. To this it may be added that certain disinfectants, so-called, possess very slight germicide

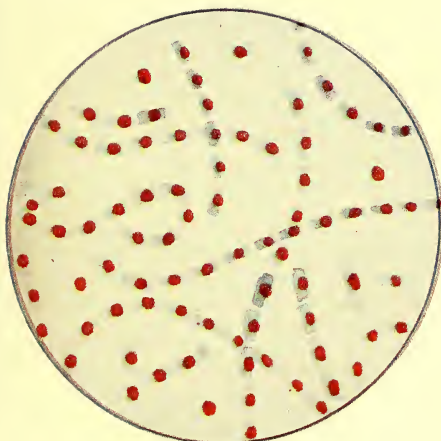
properties. In the first instance, if we take such a disinfectant as Condyl's Fluid we find this substance, as has been well expressed, "nearly powerless to destroy the germs of infection." Excellent as an application to wounds by way of a cleansing agent, it would be useless in a case in which there was necessity for destroying the germs of, say, typhoid fever and cholera.

Amongst those substances which are widely employed as chemical disinfectants *carbolic acid* has long held a high but undeserved reputation. Here a caution must be given regarding *the employment of disinfectants in solutions of too weak strength*. Commercial competition has to a large extent induced the practice of recommending certain disinfectants to be diluted with water in proportions utterly unfitted to destroy the germs of disease. Hence the use of such solutions represents a positive danger, in that they are incapable of effectively disposing of disease microbes. If fever-infected clothes could be removed from a sick-room without incurring risk of infection, and be immediately plunged into a boiler containing a solution of such a soap as Sunlight soap, or, still better, of "Y.Z." soap, and be thoroughly boiled, all risk of infection would be avoided. This practice might, indeed, be carried out if, as has already been shown with regard to the care of the sick-room, clothes taken off the bed or body of the patient are first plunged into a disinfectant solution placed by the bedside. If carbolic acid is employed for disinfecting purposes it must not be used in a less strong solution than five parts to a hundred of water. Even in this strength carbolic acid cannot be relied upon to dispose effectively of all microbes. If we attempt to increase the amount of carbolic acid to the amount of water we find that water will not take up probably more than a slight excess over the amount just mentioned. Another disinfectant is represented by *chloride of lime*, which may be used in the proportion of two ounces to the gallon of water; whilst another way of preparing a solution made of this substance is that of taking seventy grains of chloride of lime, added to six grains of brine to one gallon of water. *Jeyes' Fluid* is an efficient disinfectant, but for all ordinary purposes *Izal* is to be preferred. Unlike carbolic acid, it is non-poisonous, and is undoubtedly much more powerful as a germicide. Five parts of *Izal* to a hundred of water will be found effective for all purposes of ordinary disinfection. Indeed, the proportion of this disinfectant used may be less than that just mentioned. A highly powerful disinfectant is that known as *bichloride of mercury*, which is a poisonous substance, and therefore must be carefully handled. It is sold in tabloids, each of which, dissolved in a certain amount of water, produces a solution to the extent of about one to 1000 of water, in which strength it is

capable of destroying every species of microbe. A mode of making the bichloride solution is that of adding half an ounce of that substance to three gallons of water, in which one ounce of hydrochloric acid and five grains of aniline blue have been dissolved. The object of adding the blue is that of colouring the solution so that it may not be mistaken for a non-poisonous or harmless fluid. *Chloride of zinc* forms the chief ingredient of what is known as *Burnett's Disinfectant Fluid*. *Sulphate of iron* is another substance generally used in the strength of one pound to a gallon of water. This makes a strong solution, but presents no advantage whatever over the use of a disinfectant such as Izal. The solutions indicated as of powerful nature, it will be understood, can be used not merely for the disinfection of the clothing, but also for rendering bowel discharges innocuous in such a case as that of typhoid fever.

The Disinfection of Houses.—Presuming that a fever patient has been treated in a private house, it now becomes of importance to discuss the measures that may be taken in connection with the disinfection of the patient's room, so that all risk of infection of those occupying the apartment subsequently may be avoided. *Fumigation* of the room by one method or another is the method generally adopted of destroying any disease microbes which may be contained in any part of the apartment. Various gases are used for this purpose, these being generated in various ways. A German method is that of using stale bread, by way of cleaning the walls of the room, all particles of bread being carefully gathered up and immediately burned. This process is, however, usually performed after the room has been duly fumigated. Formalin is occasionally used in the form of a spray, which is distributed throughout the whole apartment to walls and floors. Sulphur candles, or bisulphide of carbon, are also used to produce a disinfectant vapour. It will be understood that, in fumigating a room, all apertures must be carefully closed. The damper of the grate should be pulled down, and the opening of the grate stuffed with newspapers. The windows should be carefully closed, and keyholes and spaces under the doors should also be stopped with paper, by way of preventing the escape of the fumigating gas. The substances used, in addition to those already mentioned, are: first, sulphur, which should be burned in the room, in the preparation of one lb. to every 1000 cubic feet of space. The burning of sulphur in air gives origin to sulphurous acid gas. The sulphur should be burned on an iron tray, a little spirits of wine being placed on the sulphur so as to favour combustion. The tray should in turn be placed over a tub of water to obviate any danger from fire. Whenever any such substance is lit, the person operating

BACTERIA.



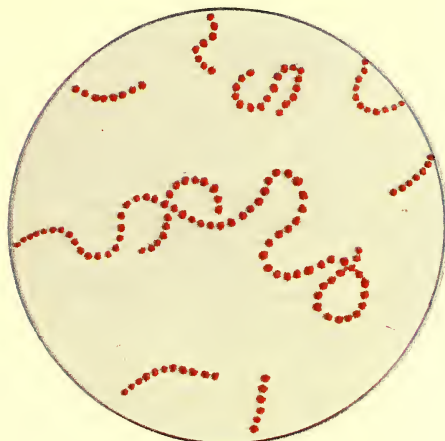
ANTHRAX.



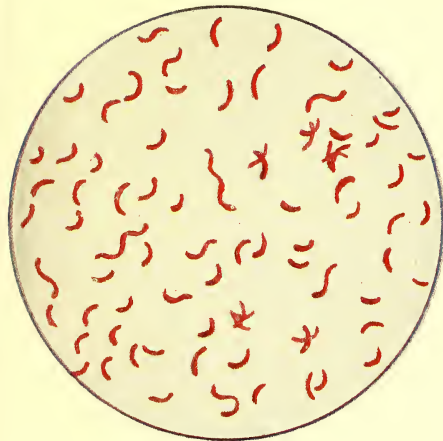
TYPHOID.



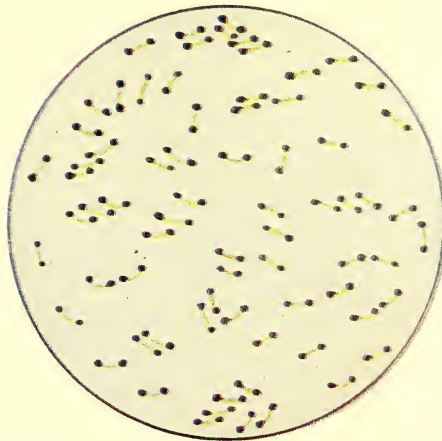
COLI COMMUNIS.



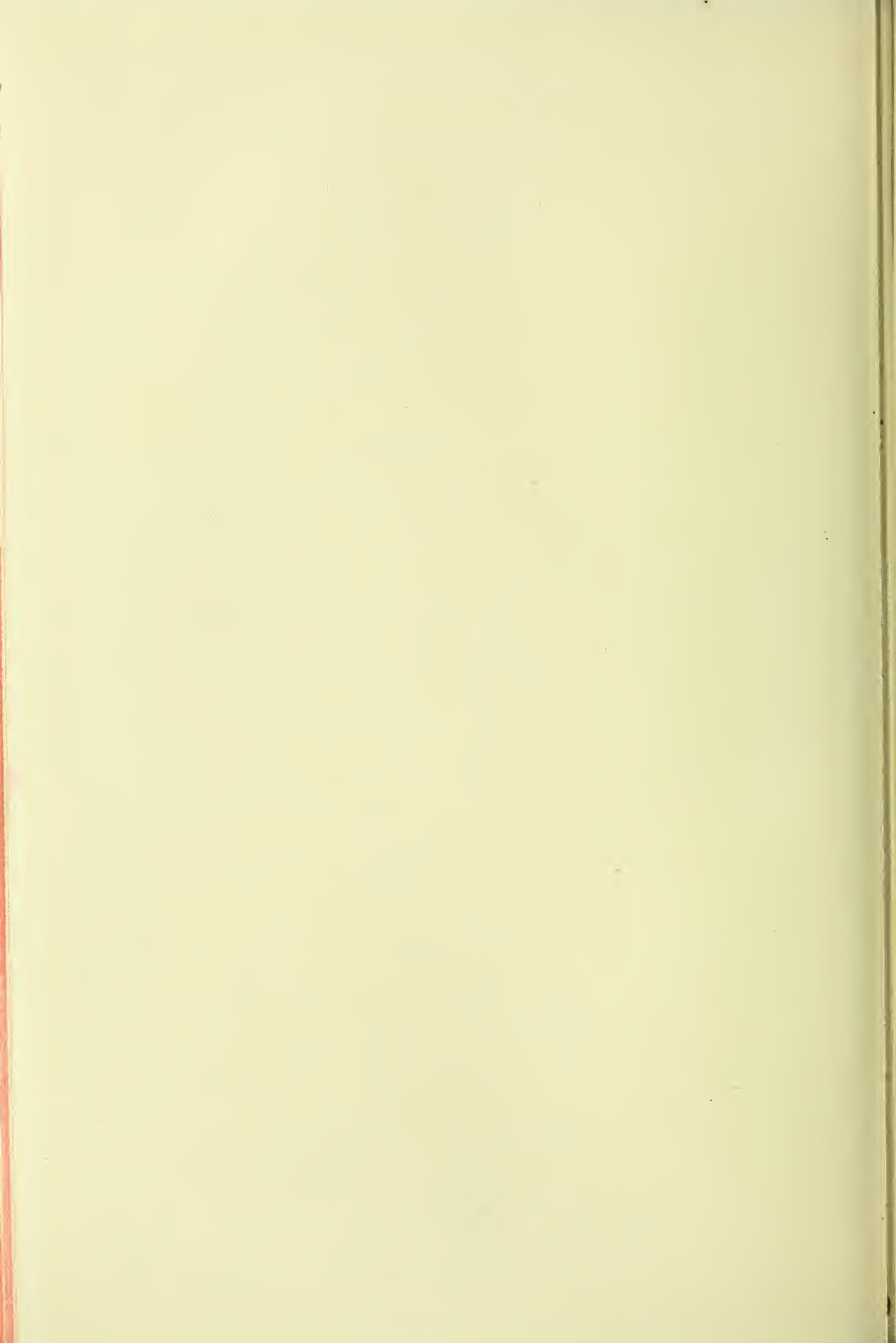
STREPTOCOCCI.



CHOLERA.



DIPHTHERIA.



must immediately leave the room, closing the door behind him, and the room should be kept closed for at least twelve hours to allow of the gas affecting all parts of the apartment. Where *chlorine gas* is used, it may be made for each 1000 cubic feet of space by mixing eight ounces of salt and two ounces of dioxide of manganese. On this mixture, placed in a flat dish, two ounces of sulphuric acid and two ounces of water, mixed together, are poured. It is recommended that the dish should be placed inside a vessel containing sand. *Nitrous acid* is also sometimes employed for the disinfection of a fever room. For each 1000 cubic feet of space one ounce of copper shavings is used, and three ounces of water and of nitric acid, mixed together, are poured on the copper contained in a jar. The caution may again here be given that when any disinfection operation is carried out in the manner described, *the person operating must go out of the room immediately, closing and sealing the door.*

After Treatment of the Room.—The after treatment of a room which has thus been fumigated, after being left to the action of the gas for a period of not less than twelve hours, is that of rubbing down the walls with bread, after the manner already described. More effective, perhaps, is the plan of stripping the walls of paper and burning it; the ceiling being rewashed, and the floors scrubbed with hot water and a disinfectant soap, of which the "Y.Z." soap, already mentioned, or Izal soft soap, are examples. Some authorities recommend the additional washing of all wood-work with the bichloride of mercury solution, already mentioned. It is also important that, after fumigation of the room, the windows should be thrown widely open so as to admit the free access of air to all parts of the apartment. Another notable point is that which recommends that the walls and floors should be moistened with water before fumigation by any gas is carried out, seeing that such gases tend to effect their disinfectant action more effectively on moist surfaces than on dry ones.

SECTION V

DISEASES OF BONES AND JOINTS

IN considering the diseases which affect the bones, we must always bear in mind that bone is a living tissue richly supplied with blood-vessels and nerves, and that the diseases which we meet with in it differ from those which we find in other tissues, such as, say, in muscles and skin, only in so far as they are modified by the peculiar *composition* of bone.

We can prove that there are two substances present in bone, the one *organic* and the other *inorganic*, by the following experiments. We place a bone in a strong solution of *vinegar* or acetic acid, and find that after it has lain there for some time, it has lost all its *hardness*, and can now be *bent* to any shape we please. What has happened is that all the inorganic or earthy matter has been dissolved out by the vinegar, leaving only the organic matter, which consists of *gelatin*.

Again, if we take a bone and burn it in a strong fire, we find that it has been converted into a white mass resembling chalk, which still retains the original shape of the bone, but is so friable that we are able to crumble it into dust between our fingers. The gelatine has been burnt out by the fire, and only the earthy matter remains. This consists mostly of *phosphate of lime*, with a small admixture of *carbonate of lime*. We see, then, that bone is composed of gelatine and phosphate of lime. During the very early period of life the bones are composed entirely of gelatine, and it is only gradually, as the animal grows older, that the earthy matter is laid down in it. Thus it is that in children the bones are much softer than in adults; and, as we shall see later on, if children are improperly fed, the earthy matter is not laid down at all, and the bones remain soft, which is one of the most marked symptoms of the disease termed *rickets*.

As has already been remarked, bone is richly supplied with blood, which reaches it from two sources, the one being the *nutrient artery*, which perforates the bone, and breaking up into innumerable branches in the interior, supplies the marrow; the other the *periosteum*, which is a strong membrane that completely envelops every bone, and the under surface of which is composed of a fine network of blood-vessels which send branches into the substance of the bone, however dense it may apparently be.

The whole bone is thus continually bathed in the nutrient fluid

of the blood and nourished and kept alive, the branches from the nutrient artery uniting with those from the periosteum in the substance of the bone.

Were we to cut through the *shaft* of a long bone, such as the thigh-bone, we would find that it was tubular, the walls of the tube being formed of *dense* bone, whilst the cavity itself is full of a yellow substance termed the bone marrow; but when we cut into the *end* of a long bone or into an irregular bone, such as one of the bones of the wrist, we find that the interior does not comprise a single cavity, but is divided into a great many small spaces by minute plates of bone, the spaces being filled with marrow of a red colour. This form of bone is termed *spongy* bone, so that structurally there are two varieties of bone; the *dense*, forming the shaft of long bones and the outer surface of irregular bones; and the *spongy*, forming the interior of the ends of long bones and of the irregular bones. Whatever the structure of the bone, however dense it may be, all bone is permeated by blood-vessels and nerves, which, together with the gelatine foundation, form the organic part of the bone, and render it liable to the same diseases as the other living tissues of the body are subject to. From this brief account of the anatomy of bone we pass to a description of some of the diseases which we meet in it, space permitting us to consider only *inflammation*, *caries* or ulceration, *necrosis* or mortification, and *rickets*.

INFLAMMATION OF BONE

Inflammation of a bone may be *acute* or *chronic*. It may arise suddenly, from no known or discoverable cause, or may be the result of an *injury*, such as a *blow* or a *sprain*; and lastly, it very frequently follows a *compound fracture*, and is the danger most to be dreaded in such an accident. But the form of inflammation which we purpose discussing is that known as *acute inflammation of the periosteum*, and is often spoken of as *acute necrosis*, from the rapidity with which the inflammation terminates in the death or necrosis of the bone. This dangerous disease is almost entirely confined to the period of life during which the bone is *growing*—that is, before *puberty*. It occurs more frequently in boys than in girls, and as the inflammation generally starts *near* a joint, it is frequently mistaken for *rheumatism*. A careful examination will, however, reveal the fact that the joint is in no way implicated. The early symptoms are sometimes described as “growing pains.” Growth is not accom-

panied by pain, and mothers would be well advised never to treat lightly the complaint frequently made by children of pain in the neighbourhood of a joint.

Causes.—The disease frequently attacks children during the period of convalescence after *scarlatina*, *measles*, or *whooping-cough*. It may be the result of exposure to *cold* and *wet*, or may follow a fall or blow or a sprain in the case of an otherwise delicate child.

Symptoms.—These are usually *sudden* in their onset. The boy, who was apparently quite well when he rose from his bed in the morning, may, towards evening, complain of a *pain*, which had commenced quite suddenly, in one of his bones, and the *thigh-bone* is more frequently affected than any other. On examination the affected limb is found to be *swollen*, the *skin is red*, and very *tender* to the touch. The *temperature* rises rapidly, so that it may be 104° F. a few hours after the first complaint was made. The boy has *shivering fits* and becomes *delirious*, and he may have *convulsions*.

Treatment.—As has already been remarked, pain in a bone should never be treated as a symptom of no importance in children, especially when it has set in suddenly. The child should be put to bed, and kept at *rest*, and if the temperature rises, and the limb becomes swollen and red, a surgeon should be consulted at once, as the one hope of saving the limb—indeed, of saving the child's life—is for an *incision* to be made down to the bone to relieve the tension; otherwise matter will form between the periosteum and the bone, cutting off the blood supply from the latter, and so causing its death, and in all probability the child also dies of blood *poisoning*.

Ulceration of Bone or Caries.—Ulceration of bone begins as a *slow* inflammation; the bone, instead of being killed outright, is gradually eaten away. The ulcer may be situated on the *surface* of the bone, in which case it is usually associated with an open sore in the skin and soft parts lying over it; but the disease more frequently begins in the *interior* of spongy bones, and its favourite site is in one or other of the bodies of the *vertebrae*, or bones which form the spinal column, giving rise to "spine disease," or *spinal caries* in children, and here the skin and soft parts are not implicated, and there is no ulcer or sore on the surface of the body. The disease gradually eats away the bone, and the unaffected vertebrae fall together, causing a curvature of the back, which mothers describe as a "growing out." It is essentially a tuberculous disease, the history of *consumption* being often well marked in the family, and it is frequently associated with signs of tuberculosis in other regions of the body, such as *scrofulous glands* in the neck. Spinal disease generally has its com-

mencement in a fall on the back, it may be from a perambulator or downstairs. The early *symptoms* are difficult to determine, but the patient is easily *fatigued* and complains of being tired. The child begins to look old and *careworn*, and complains of *pain* in his back. On watching him carefully it will be noticed that he walks downstairs cautiously and never jumps. To avoid the pain due to movement of the spine, he keeps his back very stiff. At table he generally sits forward with his elbows resting on the table, and his chin supported by his hands. As the disease progresses a hump begins to show itself on his back, which, as has already been mentioned, is described as a "growing out" by the mother.

Treatment.—The advice of the family physician should of course be obtained at the earliest possible moment, and the best treatment is to keep the child at *rest in bed*, lying on his back, and he should not be allowed to sit up. The diet should be nourishing and easily digestible, consisting largely of milk and milk puddings, and plenty of fat in the shape of cream and butter. Medicinally he should have cod liver oil, plain, or combined with malt if he can digest it, and *iron* in some form. But rest in bed is the most important part of the treatment.

NECROSIS

When, as a result of acute inflammation, a bone dies, no more blood is supplied to it, and it becomes hard and white, like a dead bone outside the body, and nature attempts to *cast out* the dead portion of bone and to *replace* it with *new bone*. To solve the first problem, the periosteum or membrane which surrounds the dead bone, and which supplies it with blood during its lifetime, separates itself from it, and at the same time a process of *ulceration* starts at the points where the dead bone is continuous with living bone, and this gradually eats away a division between the living and the dead, so that the piece of dead bone lies isolated in the midst of living tissues. But the ulceration which had started in the bone gives rise to the formation of matter or *pus*, which burrows its way through the periosteum and finally perforates the skin to form an *ulcer* on the skin. By passing an instrument called a *probe* into this ulcer the dead bone can be felt at the bottom of it. During the time that the ulceration has been cutting off the dead bone from the living, the periosteum, which has already separated itself from the dead bone, becomes chronically inflamed and pours out material which becomes organised into *new bone*, and this surrounds the dead bone like

a case. Under favourable circumstances nature herself now pushes out the bit of dead bone through one of the holes in the skin made by the ulceration, and when this has been effected, the new bone formed by the periosteum increases in thickness until such time as it completely replaces the dead bone which has been cast out. Unfortunately it is very seldom that nature is able to effect the cure unaided, and consequently the surgeon has to step in, and, choosing the time when the dead bone has been completely separated from its living surroundings, cuts down to it and removes it. As examples of necrosis following after inflammation, we may instance that which occurs in the end bone of the finger, which becomes inflamed and dies and has to be removed in four or five weeks; this disease being generally known as *whitlow*. Again, we find the necrosis which attacks the *jawbone* in children after such a fever as *measles*, when the bone in the neighbourhood of the teeth becomes inflamed and painful, and terminates in an *abscess* and the complete death of the bone. When common phosphorus was largely used in the manufacture of matches, and no steps, or inadequate steps, were taken for the protection of the workers, the fumes of the phosphorus reached the jawbone through the sockets of unsound teeth and caused necrosis of the bone—the affection being termed *phossy jaw* by the workers. This form of necrosis has, however, become very rare since the introduction of the red or amorphous phosphorus into the manufacture of lucifer matches. The *treatment* consists in the removal of the dead bone by the surgeon.

RICKETS AS A BONE DISEASE

["Rickets" has already been dealt with (vol. i.) as a constitutional ailment. It is here treated as a "Bone Disease," with special reference to symptoms and treatment.]

This is a disease of *infancy*, and usually appears during the first or second year of life, no age being too early for its appearance. Whilst its most prominent symptoms are displayed in the bones, the affection is really due to *impaired nutrition*, which leads to an alteration in the *consistence* of the bones, and to an *overgrowth* of imperfect bone. There is a great diminution in the amount of *inorganic* material in the bone, so that it becomes *soft* and bends easily, and this, together with the overgrowth of imperfectly formed bone in the neighbourhood of the joints, gives rise to the *deformity* which is frequently so marked a symptom of the disease. Children

reared on artificial foods or farinaceous diet are more liable to rickets than those who are suckled by their mothers; consequently the disease is by no means confined to the poor.

Symptoms.—One of the earliest of these is *restlessness* at night; another is a tendency to *perspire* freely during sleep—the mother noticing that the head is bathed in perspiration and the pillow wet. In the *bones*, the first change to be noticed is a thickening at the ends of the *ribs* where they join the costal cartilages, so that a row of small lumps like beads can be felt on each side of the chest a little to the right and left of the breastbone; these lumps go to form what is known as the *rickety rosary*. The *teeth* are late in being cut, or they may appear in a wrong order. The bones of the *skull* are soft and yielding, and the opening between the bones just above the forehead where the throbbing of the brain can be felt, which should be closed at about the eighteenth month, remains open for a much longer time. The *chest* becomes altered in shape. Owing to the softening of the bones, the ribs are pressed inwards, and lateral grooves are formed on either side of the breastbone, the grooves running longitudinally.

Various changes occur in the bones of the *limbs*, the earliest of these being enlargement of their *ends*; this change is well marked at the *wrists*, where, from the thickening of the ends of the bones of the forearm, it appears as if there were two joints present, and this condition is spoken of as *double-jointed*. From being carried in a sitting position on the mother's arm, the *thigh-bones* bend, and if the child can walk and is allowed to do so, he gets *bow-legged*, though this latter symptom may appear in children who have never walked. The opposite condition of *knock-knee* is also very frequently met with. Children suffering from rickets are very liable to *nervous* disturbances, amongst the most frequent of which is *child crowing*, or *Laryngismus stridulus*, which is only a form of *convulsion*, the child's larynx being suddenly, as a result of some irritation, thrown into a *spasm*, so that he cannot breathe. He lies back with every muscle in his body stiff, and his face becomes pale and then livid, and the eyes staring. When the spasm passes off, the child draws a breath, and this is accompanied by a loud *crowing* sound. General convulsions are also common. The *digestive* system is deranged, so that the child's motions are large and frequent, and containing as they do masses of undigested food, are very offensive. The belly is large; the distension being due to the accumulation of flatus in the bowels. Rickety children are very sensitive to *chills*, so that they are seldom without a *cough*.

Causes.—It has already been pointed out that rickets is a disease of malnutrition, but by this we do not mean that it is

entirely due to *insufficient* or *improper* food, but equally important factors in maintaining the health of a child are *pure fresh air*, *sunlight*, and *warmth*; so that a child who is *properly* fed, but improperly clothed, or who lives in an ill-ventilated room, may develop rickets; whilst the child who is *improperly* fed, but is kept warm and supported with pure fresh air, may escape.

The most fruitful cause of rickets, however, is undoubtedly the *patent foods* upon which so many children are reared, composed as they are to a great extent of starch, which the infant is unable to digest. Next in order comes *exposure to cold*. The child is "shortened" at the age of three months, and is allowed to go about with his arms and legs bare, whilst the "binder," which keeps the abdomen warm—so important a point—is also removed. And lastly, the rooms he occupies are *badly ventilated*. Instead of the house being kept at an even temperature all over, we often find that the nursery is over-heated, whilst the other rooms in the house are not heated at all; consequently, in passing from one room to another the child is exposed to *chills*. Or again, because the child is considered to be delicate the windows of his room are never opened, and there is no attempt made at ventilation.

Treatment.—The great preventive lies in mothers *nursing their own babies*; if unable to do so for the full term of nine months, they can at least try and manage it for a few months. Such trivial excuses are given sometimes for giving up nursing; whilst, as a matter of fact, most women are much better in health whilst nursing, and the benefit to the child is incalculable. Should the mother be really unable to nurse the child, some method of *artificial feeding* has to be adopted, and none should be considered for one moment which is not largely composed of *fresh cow's milk*. The best food is cow's milk diluted with an equal quantity of water during the first weeks of the child's life—the proportion of milk being gradually increased as the child grows older—and the surest guide as to whether or not the food is agreeing with the infant is the *condition of the stools*. These should be of a yellow colour, have no offensive odour, and should not exceed two in number in the twenty-four hours. If white masses of undigested curd appear in the stool, some change in the diet is indicated, and thin barley-water may be substituted for the water. It is sometimes advantageous to use *condensed milk* as a temporary measure, but as a *temporary* measure only. Or again, it may be necessary to *peptonise* or partly digest the milk when the digestive powers are very weak. After about the sixth or seventh *month* there is no better food for the child than well-boiled and strained *oatmeal* and milk. Whilst

after twelve months, gravy and potatoes, meat broths, and small quantities of vegetables and fruit with milk puddings may be added to the dietary ; but oatmeal and milk should still form its principal items.

Clothing.—The child's whole body and limbs should be enveloped in *woollen clothing*, special attention being paid to the abdomen. If mothers would only bear in mind that *chills* are the most fruitful sources of infantile troubles, they would be less willing to sacrifice the child's health for the sake of appearances ; and by woollen clothing we do *not* mean "flannelette," which, whilst it may impart a feeling of warmth for a time, most certainly does not protect a child from chills, having no wool whatever in its composition.

Ventilation.—The rooms should be kept warm, 60° to 65° Fahr. ; but overheating must be carefully avoided, and plenty of fresh air admitted without the creation of draughts.

Baths.—The child should receive a good wash with soap and water every morning, and be sponged in the evening, but the bath should not be too hot—90° Fahr. at birth and brought down to 80° Fahr. at six months ; and about this age too it is well to cool down the water of each bath so that the last sponge before the child is taken out of the bath is quite cold. Friction with a rough towel is also advisable.

Medicinally.—Cod liver oil in small doses to begin with—ten drops after meals—gradually increased if it does not disagree with the digestion ; iron wine, steel drops. Syrupy preparations of iron should be avoided, as they disagree with the stomach ; but whilst iron and cod liver oil are good in their own way, it must be borne in mind that proper feeding, fresh air, sunlight, and proper clothing are far more important factors in the avoidance or cure of rickets than any medicine.

SCURVY-RICKETS

This is a disease which occurs in bottle-fed children, and in which the symptoms are a combination of those of scurvy and rickets. Some signs of rickets, such as the "rickety rosary" or "double-joints," are present. The child is sallow-complexioned, and suffers from digestive derangements, but the most characteristic feature is the strong objection he shows for *meat and vegetables*. The limbs are painful to touch, and sometimes swollen. The *gums* are swollen and spongy in some cases. The *treatment* consists in feeding the child on fresh milk, raw meat juice—a few teaspoonfuls a day to begin with. The juice

of an orange to infants, and to older children fresh green vegetables in addition to orange juice. The painful limbs must be kept at rest; the child must be warmly clad and live in a well-ventilated room.

DISEASES OF JOINTS

In considering diseases of joints we have to bear in mind that a joint consists of three important structures: (1) the *bones*, which enter into its formation; (2) the *cartilage*, which covers the ends of the bones and renders their surface smooth; (3) the *synovial membrane*, which is a sac that encircles the joint, and is attached to the edges of the articular surfaces of the bone forming the joint. It secretes the fluid which *lubricates* the joint. The blood-vessels which supply the joint with nutriment lie in the bones and in the synovial membrane, the cartilage having no direct supply of its own, but deriving it indirectly from the bone or the synovial membrane. All forms of disease in joints begin either in the bone or in the synovial membrane, and always as an *acute* or *chronic inflammation* of one or other of these structures. The disease never *begins* in the cartilage, because the cartilage has no blood-supply of its own, but it quickly *spreads* to the cartilage from either the bone or the synovial membrane. When the inflammation begins in the synovial membrane the first symptom that points to anything being wrong is *swelling of the joint*, due to *fluid* being poured out into the joint. If the inflammation is acute in character, the joint, in addition to being swollen, is *red* and *hot*, and *painful* to touch or move. The body temperature rises, and the pulse is quick. In the *chronic* form of inflammation there are no constitutional symptoms such as rise of temperature, &c., but the synovial membrane becomes thickened, the swelling of the joint persists, the joint becomes stiff, and eventually the inflammation spreads to the cartilage and bone, and the joint becomes completely disorganised.

One form of chronic inflammation of the synovial membrane known as "pulpy disease" or "gelatinous degeneration" of the joint, is commonly met with in children who are supposed to be scrofulous. Here the swelling of the joint has a soft doughy feel, and is unaccompanied by pain, the only symptoms being the swelling, with some stiffness and resultant lameness.

The **Treatment** in the acute form of inflammation is to give the joint *perfect rest*, and to apply warm applications in the form of fomentations frequently renewed. In the chronic form—*rest*, and counter-irritation in the form of small blisters repeatedly applied,

changing the point of application on each occasion, so that eventually the whole surface of the joint has been blistered. In the chronic form in children—rest, tonics, and as much fresh air as possible.

When the joint disease begins in the *bone*, the earliest symptoms is *pain* in the neighbourhood of the joint; and this pain is frequently mistaken for rheumatism, or is attributed to “growing pains.” There is no swelling of the joint at the commencement of the disease, and no fluid poured out into the joint, as is the case in inflammation beginning in the synovial membrane; the symptoms, in fact, are *obscure*, and thus all the more dangerous, as they are allowed to pass unheeded until other symptoms—such as lameness and stiffness of the joint—become marked. The pain becomes more severe, and the inflammation has spread from bone to the cartilage, and the disease from being one of *bone* becomes one of joint.

HIP-JOINT DISEASE

Though disease of the hip-joint is usually discussed as if it were one peculiar to itself, it differs in no respect from the same affection in other joints. The starting-points are the same as in other joints, either the *bone* or the *synovial membrane*. The difficulty of discovering the disease depends on the fact of the joint being covered by muscles which mask for a time such a symptom as *swelling*, which can so easily be detected in a superficial joint, such as the elbow or the knee. Hip-joint disease is very common, and the large majority of cases occur in persons under twenty years of age. The *symptoms* vary—one child complaining of *severe pain*, whilst another experiences none whatever but *limps*. *Swelling* can be detected in one case, but is absent in another. These peculiarities are explained by the facts already referred to, that when joint disease begins in the *bone*, *pain* is the earliest symptom; and when it begins in the *synovial membrane*, *swelling* is first noticed. A very important guide to the condition of the joint is the *attitude* of the patient; for when there is swelling in the joint, to relieve the tension the patient *bends his thigh* and rests only his toe on the ground, whilst he puts all his weight on the sound limb. If the patient lies on his back on the ground, he lies with his *knee bent*, and if the limb is straightened by pressing the knee to the ground, the back is *arched*. It is well to remember that the pain of hip-joint disease is very frequently referred to the *knee*, and further, that the pain causes the child to start in his sleep. It is of the utmost importance that the disease should be discovered and

treated at the earliest possible moment, for it is a local disease, and curable if taken in time. Its starting-point is frequently some *local injury*, such as a fall on the hip, and pain persisting after such an accident should never be treated lightly.

Treatment consists in keeping the patient lying flat in bed, with the limb fixed by means of a special splint or with weights until the disease is arrested. When this occurs, the joint is still kept fixed in its splint, but the sound limb is raised four or five inches by a patten fixed to the boot of the sound limb, so that with the help of crutches the child can move about and get into the fresh air, the injured limb being raised from the ground, and not allowed to touch it on any account.

SECTION VI

TROPICAL DISEASES

By tropical diseases we do not mean diseases which are *strictly limited* to tropical regions, but diseases which are *specially prevalent* in warm climates. Thanks to the indefatigable labours of scientific physicians of the type of Manson and Ross, much light has been thrown on to this subject in the last few years, and in many cases the cause of the disease, and the manner in which it is propagated, have shown the way to what is after all the most important thing in the study of all human diseases, namely, the means of preventing them. Special centres for the study of tropical diseases exist in London and Liverpool, which have been generously supported by the mercantile classes of the country, for it has been clearly recognised how important the subject is in furthering our commercial interests in those vast tracts of the earth which have been stigmatised "the white man's grave." It seems that most of the diseases are due to germs or parasitic organisms, and that the lower animals play a very important part in their continuance and dissemination.

Plague.—This disease, although now practically confined to warm climates, was a dreaded disease in Europe a few centuries ago. In the year 1348 the most terrible plague the world has ever witnessed devastated the Continent and reached our shores, the people perishing in thousands; it became known as the "Black Death," on account of the rapid discoloration of its victims. It last visited England as an epidemic towards the end of the seventeenth century, and is said to have claimed nearly a hundred thousand

victims in London alone. Thanks to the improvement in our hygienic and sanitary conditions which have followed in the train of civilisation, this disease (a perfect type of those due to filth and overcrowding) has been banished from our shores. Its favourite haunts now are India and Southern China, South Africa and Egypt to a small extent.

The essential *cause* of plague is now proved to be a germ called the "Plague Bacillus." Predisposing causes are filth, overcrowding, and grossly bad sanitation. The importance of this is shown in the spread of the disease in plague epidemics. Following the "trade routes" as it does, even if it is introduced into a country where strict sanitary precautions are taken, it does not spread; take, for instance, the immediate stamping out of the disease in Glasgow, where a few isolated cases occurred four years ago. Although a "catching" disease, it is not markedly so, and even doctors and nurses attending plague-stricken patients rarely get the disease. The germ is commonly introduced through small wounds or abrasions of the skin, and by the bites of vermin such as fleas and bugs, which have obtained the germs from infected rats.

Symptoms.—These begin to show themselves in about a week after infection. It usually sets in *suddenly* with fever, headache, and extreme prostration. The temperature is about 104° (Fahrenheit) or higher, the skin dry and burning, and the face assumes the characteristic haggard look, with bloodshot and staring eyes. The swelling or "bubo" in the groin occurs in a great majority of the cases, and the disease is frequently called Bubonic Plague from this fact. In some severe cases pneumonia quickly develops, and is usually rapidly fatal. Dark spots on the skin, due to rupture of the small blood-vessels, are common, and in former days gave it the name of "Black Death." It is an extremely deadly disease.

Treatment.—Very little except plying the patient well with stimulants and fluid nourishment can be done; anything tending to depression being most carefully avoided. The injection of a "serum" is now being tried with, at present, varying results.

Prevention.—In a work of this kind we are not concerned with the general measures of prevention, which include the isolation of patients (and those who have been in contact with them), the destruction of rats, &c., and the quarantine of ships—these are undertaken by the public authorities. We can here only give attention to the means of prevention in so far as they affect the individual.

In the first place, if plague should break out in your vicinity do not get unduly alarmed; remember that it does not frequently affect white people, and bear in mind the Arabic fable of the Spirit of the

Plague who went forth in the land, and who promised to only kill five thousand. He was afterwards met by another spirit who accused him of lying as well as murdering, saying, "Thy five thousand meant fifty thousand." "Not so," answered the Plague, "I took but five thousand; fear and worry killed the others."

Do not unnecessarily expose yourself to contagion, however. Always protect any abrasion or cut on the hands by a dressing. Never forget to wash your hands before eating, and rigidly exclude all vermin from your environments. A special warning should be given about dead vermin, *rats* especially. If these are found *do not handle them with your naked hands*, their bodies should be destroyed by burning.

Tropical Typhoid.—This is really the same disease as the one with which we have already dealt under "fevers," but it is referred to under the above heading on account of its importance to Europeans who sojourn in tropical countries. The existence of typhoid fever in the tropics was formerly denied, not so very long ago either by even some eminent physicians. It was entirely confused with malaria. Nearly every fever occurring in these regions was considered malarious, and accordingly treated. We know now that far from being a rare disease it is one that is perhaps most commonly fatal to the white races in hot climates. The comparative immunity of natives is probably due to a long habitation, through many generations, in the filthy and insanitary condition of so many of their towns. Even in Japan the "privies" are usually in the houses, and practically no precautions are taken to prevent contamination of water; and travellers in this country very frequently contract the disease whilst the natives are comparatively exempt. It is very prevalent among soldiers, especially for a year or two after arrival in India and the East, but after two or three years they become less liable, probably on account of acclimatisation and habituation to the altered conditions in which they live.

Symptoms.—The symptoms of the disease are like those that occur in temperate regions, except that they are often more virulent, and the mortality is much higher. Constipation is much more common than in the disease as we see it here, and it is very apt to be mistaken for malaria.

Treatment.—First of all try and prevent it by paying special attention to the rule of boiling all water for drinking purposes, and avoiding "bazaar drinks," which are by no means infrequent carriers of the typhoid germs. If you cannot be certain that the water has been boiled, you will be wise to take some light wine of the country to appease your thirst until you can attend to the matter yourself.

The *general treatment* is the same as already laid down (see Fevers, vol. i.), but we may give one word of warning. Constipation is common and may cause the disease to be overlooked; if in doubt one may be tempted to give active purgatives. This is liable to be followed by disastrous results, if the case is really typhoid, and therefore a golden rule has been framed, which says, "When in doubt give quinine and *avoid* purgatives."

Inoculation against Typhoid.—This serum-treatment was first tried during the Maidstone epidemic in 1897, and the results then obtained led to a more extensive trial on soldiers going to India, and later, during the South African war. Although there is much evidence in support of its utility, it is not, as yet, conclusive. If it eventually fulfils all that its advocates claim for it, it will become our duty to advise every one leaving for the tropics to be inoculated with this serum, but time is required to establish its value.

Beri-Beri is a disease that has lately evoked much discussion on account of its outbreak among the Chinese labourers which have been imported into South Africa for work in the mines. It is a disease of wide distribution in tropical and sub-tropical countries, and was well recognised by the early Dutch settlers in the East. Scattered cases are always present in such countries as China, India, Brazil, and the East generally, and it by no means infrequently assumes an epidemic form. It is the scourge of many of the mines and plantations of the Malay Peninsula, and is very apt to occur among "gangs" of coolies who are gathered together in mines, &c. Although of rare occurrence in temperate regions, the disease once broke out in a large lunatic asylum in Ireland, and many cases of the disease are now admitted to the dock-side hospitals in London and European ports.

The Causes.—A germ is no doubt the essential cause of Beri-Beri, but it is a disease that has a great selection for localities. Overcrowding and insanitary conditions, such as would be expected to exist among camps of coolies, form the most favourable state of things for the growth and multiplication of the germ, and in the Irish epidemic the asylum was considerably overcrowded and unhealthy. The places allotted to the crews on ships (especially if occupied by natives) are common incubators of the disease. It usually occurs at the hottest season of the year, and although it attacks all ages and those in any state of health, it seems to have a predilection for those who lead sedentary lives, and especially those who inhabit damp localities or who sleep on the ground.

Symptoms.—Beri-Beri is an inflammation of the nerves, and has a wonderful way of assuming different types. It is known as "dry" Beri-Beri or "wet" Beri-Beri and sometimes "mixed" Beri-

Beri. In the "dry" form there is great wasting of the muscles of the body, especially the legs; numbness and pain accompany. The patient often cannot drag himself about for sheer weakness, and he "fumbles" when he attempts to do things which require the action of the small hand-muscles; for instance, buttoning a coat. In the "wet" form we see an entirely different aspect of the patient. Instead of the limbs looking thin and wasted, to the casual observer he looks plump and fat. His "plumpness," however, is "water," and is due to dropsy occurring under the skin. Remember they are not two different diseases but only different types of the same. The disease shows the same erratic tendency in its mode of onset, either beginning very insidiously, perhaps, with pain and numbness, or else quite suddenly, the patient going to bed apparently quite well and waking up stricken with the malady. In both varieties Beri-Beri runs an uncertain course, many cases that look quite mild suddenly becoming critical and death quickly ensuing, or extremely bad cases recovering in a miraculous manner. The death-rate varies from five to thirty in a hundred, the great danger being from failure of the heart. Excessive vomiting and a very small amount of urine passed are usually considered bad signs. The outlook is greatly improved if the patient can be at once removed from the place where he caught the disease.

Treatment.—Remove the patient from the place where he caught the disease, if possible. Unless the patient is very weak he need not be kept in bed; in any case, he must have an abundant supply of fresh air, out of doors, wherever possible. Authorities say that rice is a bad food for those suffering from Beri-Beri, it should therefore be excluded from the diet. Milk, eggs, meat-juice, or meat, if it can be digested, may be taken. If the heart shows any sign of failure a tabloid of tincture of digitalis (5 minims) may be taken in a little water three times a day. After convalescence is established, massage to the legs and arms are beneficial and help to accelerate the return to health. The sufferer should not go back to a district in which the disease occurs.

Congestion of the Liver, or "tropical liver," as some writers call it. As is well known, the liver is one of the first organs to feel the strain of the altered conditions under which Europeans live in hot climates, and many conditions tend to produce this result. A young man, we will say, who leaves England where he has been living a healthy life with a fair amount of exercise, when he gets to India, or some such place, often finds that there are many more opportunities of indulgence than he has been accustomed to. He is inclined to eat more than usual, especially of seasoned dishes, and of those that tempt the palate after

hunger is satisfied. The great heat brings about a profuse perspiration, and the water thus withdrawn from the system is more frequently than not replaced by draughts containing alcohol. Associated with this he feels disinclined for exercise, and the feeling is accentuated by the heat that induces one to court every opportunity of "sporting in the shade." Now it can be readily understood how all this tends to congest that important organ the liver. In a mild attack of "liver" there may only be a feeling of not being quite "fit," and this is associated with a coated tongue, and maybe a little diarrhoea, which latter is Nature's way of relieving the congestion. A more severe type may occur in which there is distinct pain and tenderness in the right side just under the ribs, and the "motions" may be pale, evil-smelling, and at times frothy. This may go on, if unrelieved, to actual hepatitis (inflammation of the liver). Many will tell you that they find that these symptoms are brought on in their case by getting damp, sitting in a draught, or even taking a cold bath, a luxury that "livery" people in the tropics should eschew altogether, as, like the other things above mentioned, it tends to throw an extra amount of blood into the liver, and so to further embarrass its action.

Treatment.—The subjects of this affection must pay careful attention to their habits of living. Over-indulgence of all kinds must be carefully avoided, especially of alcohol and highly-seasoned food. Cold baths must not be taken, but the skin must be kept in good order by tepid or warm ones. If possible, horse exercise should be taken. Light *woollen* garments, even in the hottest weather, should be worn, and many assert that they secure immunity from these attacks by wearing a light Jaeger cholera-belt. In the mild attacks all that is necessary is careful dietary and a teaspoonful of Carlsbad salts in a tumblerful of hot water every morning, half-an-hour before breakfast. In the more severe attacks with offensive diarrhoea two or three grains of calomel should be taken at night and good doses of Carlsbad salts in hot water every morning for a week. The pain in the side is relieved by the application of hot stupes, to which a few drops of turpentine may be added. After the attack is well over, the following mixture should be taken: *R.* Tincture of nux vomica, 50 drops; dilute nitro-muriatic acid, 50 drops; infusion of gentian, 10 oz. Take two tablespoonfuls three times a day after food.

Abscess of the Liver.—A fairly frequent condition in India and Egypt. Alcohol and heat no doubt predispose to it, but the great cause is dysentery. This disease, as we know, causes ulceration of the bowel, and we know also that the veins that drain the blood from the walls of the bowel go through the liver, and so we see how

easily the little bodies which cause the ulceration in the bowel may get up into the liver and there set up an abscess.

Symptoms.—An abscess may remain in the liver for a considerable period and give no indication of its presence. Usually, however, there is pain in the right side or shoulder, accompanied by some enlargement and tenderness of the liver. The temperature is variable and irregular. "Shivering fits" and profuse sweating often occur, and although marked jaundice is rare, the eyes and skin frequently have a faint yellow tinge. The abscess may burst through the skin, or into the bowel (when "matter" will appear in the motions), or, by no means rarely, into the lung, when the "matter" coughed up resembles anchovy sauce.

It is a serious disease, and, like abscesses in other situations, must be surgically treated. The advisability of operating must of course be left to the surgeon. Suffice it to say that since these abscesses have been more frequently operated on the records have shown a marked decrease in the death-rate from the disease.

Bilharzia Disease.—A disease characterised by the passage of bloody urine, and due to a worm known as the "blood-fluke," which gets into the veins, especially of the kidneys and bladder. These "flukes" were discovered by Bilharzia, hence the name. The disease occurs in limited areas, especially in South Africa and Egypt; in the latter country it is said that nearly half the lower classes of the native population suffer, and many cases occur in the English soldiers who serve there. It seems certain that these "flukes" get into the human body in drinking water, and that they infest pools in the localities where the disease is rife.

The main symptom is the passage of bloody urine with or without pain, and there is usually more blood at the end of the act of passing water. The disease rarely leads to fatal results, but is very obstinate in yielding to any treatment.

Treatment.—The only one is to prevent it, and this is done by boiling all drinking water and taking care that children do not quench their thirst from pools—a thing they often like to do. If contracted, no active treatment can be adopted except careful attention to health and avoidance of excesses. If care is taken to prevent any more of the worms getting into the body the disease, after a time, will often gradually improve, and may abate altogether. If symptoms of bladder irritation occur a tabloid of five grains of urotropine should be dissolved in a wine-glassful of water and drunk, repeating it two or three times a day.

Prickly Heat.—A most annoying and often very distressing condition that white people suffer from during the hottest part of the

year in the tropics, subsiding practically altogether when the comparatively cold weather comes. It is due to profuse perspiration, and the pricking and irritation is most acute where skin surfaces touch each other, as, for instance, in the armpits, groins, &c. An eruption of very small, shining little elevations appear on the skin often around the waist, and to the touch they feel almost like grains of sand. The irritation is sometimes intolerable.

Treatment.—Avoid any exercise that tends to produce profuse sweating. Sleep in light woollen *pyjamas* (not nightgown). A good preventive measure is to rub into the folds of skin, after bathing, the following powder: Powdered boracic acid, 1 part; oxide of zinc, 1 part. In many people this often prevents the disease entirely. Another remedy that is much talked of is equal parts of almond oil and pure vaseline well rubbed in every night, and sulphur ointment has advocates who swear by it. Soap must either be used very sparingly or not at all. A lotion of carbolic acid, 1 part to 60 parts of water, or of Wright's coal-tar solution, is often successful in allaying the irritation.

SECTION VII

VENEREAL DISEASES

Syphilis.—Syphilis is a specific disease which is propagated by inoculation (*acquired syphilis*), or is transmitted from the parents (*congenital syphilis*). It is unfortunately a common disease in the community, and the taint of syphilis is almost as common as that of consumption.

Although syphilis was common in India and China centuries ago, it only became prevalent in Europe towards the end of the fifteenth century, and one of the first serious outbreaks recorded was that which occurred among the French soldiers at the siege of Naples in 1494. Since that time it has completely overrun Europe, and probably the greatest factor of its dissemination has been war. It has always been more prevalent among the military part of the population, and the disease in some armies has had a most evil effect upon their efficiency.

The Cause.—There is but one cause of this disease, namely, the absorption into the blood of the syphilitic poison, and its gradual

diffusion throughout the body. This poison can be transmitted from one person suffering from the disease to another by direct contact, or as said before, it may be transmitted to the offspring of syphilitic parents. The poison may be carried in various ways—(1) by the discharge from the sore on the genitals of one; (2) from the discharge of what are known as the *secondary* eruptions which occur later in the disease, and from other, but somewhat rare, sources.

The most frequent mode of contagion is the *direct*, and this usually occurs in sexual intercourse. Another way is from kissing a person who is suffering from syphilis, and in this case the sore would first of all appear on the lips. Midwives and doctors are sometimes infected on the fingers, and a wet-nurse may acquire the disease from suckling a syphilitic infant. There is an indirect way of being infected from such articles in common use as spoons and glasses, pipes, &c., and one which raised a considerable amount of discussion in the daily press a few years ago, namely, the communion cup. It is now agreed by all sensible ecclesiastics that precautions ought to be taken to obviate as far as possible this, if vague, at least a possible source of infection of the innocent.

Inherited Syphilis.—In this case the offspring of parents suffering from syphilis are born with the disease, the symptoms of which may only be manifested some time after its birth. Probably the most common way is where the child is infected by the father, the mother being healthy. It is a common experience to see cases of hereditary syphilis in which the infection is undoubtedly from the father. In rare cases a man may have had syphilis when he was young, and for years have had no sign of the disease, and yet his first-born may be syphilitic. Fortunately, however, this is rare, and experience abundantly proves that *where the treatment has been thorough* the power of infecting the children rarely lasts longer than three or four years. It is a very remarkable fact, a woman who has borne a syphilitic child is immune to the disease even though she herself has never had any obvious sign of syphilis. The child will infect a wet-nurse or any one merely handling or dressing it, but this child will not infect its own mother, even though she suckle it during the most infectious stage of the disease. This was carefully studied and observed by a well-known Dublin surgeon named Colles, and it is known to the medical profession as *Colles's Law*.

The foregoing somewhat long description of the disease is necessary to give the reader an intelligent idea of the *preventive* treatment of syphilis, which we shall discuss later on, but we may now pass on to talk about the symptoms and signs of syphilis.

Symptoms of Acquired Syphilis.—These are divided into three stages, respectively those of—

- I. The PRIMARY SORE.
- II. SECONDARY SYPHILIS.
- III. TERTIARY SYPHILIS.

We will discuss them separately.

STAGE I. After the time at which the person has exposed himself to the disease, a period varying from three to six weeks elapses before anything wrong is noticed. The average time is about three weeks. At this time a small ulcer or sore makes its appearance on the genital organs, and gradually enlarges, but never becomes very large. The characteristics of this sore are, first, that it is almost always a *single* sore, and secondly, that the flesh underneath it becomes hard and gristly. Thus it is usually known as the “hard chancre” to distinguish it from another variety of sore known as a “*soft chancre*,” and to which we shall refer later on. Following upon the appearance of this sore or chancre, as it is called, in a few days lumps begin to come in the groin. They are the enlarged glands there, and they are usually hard and painless and about the size of marbles. All this comprises what is called *primary syphilis*, and after lasting for about six weeks to two or three months, goes on to the second stage, called **Secondary Syphilis**.

STAGE II. In the secondary stage the disease is beginning to tell on the general condition of the patient, and headaches and a general tired feeling comes over him; later on he gets to look pale. One of the first signs of this stage is a rash which first appears on the chest and sides of the body. It does not itch usually, and after a time becomes scaly and the colour of raw ham. Afterwards it appears on other parts, and two very favourite sites are the borders of the hair (top of forehead) and the palms of the hands. Associated with this rash, or maybe coming on after it has faded, the mouth and other orifices of the body become affected. In the mouth and throat small shallow ulcers appear, especially on the back of the throat, and this “sore throat” is a very frequent and constant symptom. Just where the mucous membrane of the lip joins the skin, and also where the mucous membrane of the lower opening of the bowel (the anus) joins the skin, small whitish elevated patches appear, called *mucous tubercles*. They are moist, and are perhaps the most contagious of all the various syphilitic manifestations. “Warts” also appear around the anus, &c.

A very important inflammation of the eye known as *iritis*, or inflammation of the coloured part of the eye, is common in this stage, and demands prompt attention. It is treated of in another part

of the book under eye diseases. Deafness sometimes occurs, but usually disappears under proper treatment. Inflammation of the testicle is by no means rare. This second stage lasts from six to eighteen months, and during it the patient's stamina is put to a severe test. It must not be forgotten that the secondary stage is occasionally so mild as to pass unnoticed by the patient even without treatment, but this is rare, and is no criterion as to the future course of the disease, which is often in these cases very virulent if mercury has not been taken. We now come to the third stage.

STAGE III. The Third or Tertiary Stage.—No very hard and fast line can be drawn between the secondary and tertiary stage of syphilis, but speaking generally, we may say that the symptoms of the *secondary* are usually superficial, and those of the *tertiary* are usually deep.

The time in which the symptoms of the latter stage develop is also subject to very great variation, and may come on any time from one to twenty years, though they are rarely so late. Studied closely these tertiary symptoms are found to be due to the growth of lumps of hard tissue in various situations. They are known as "gummata," and are peculiarly liable to soften, or degenerate as it is called. Thus they occur in the skin, and after softening the skin gives way, and an ulcer is formed. These tertiary ulcers are very common in this stage of syphilis, and occur most frequently on the legs.

Gummata may grow on the bones, where they are called "nodes," or they may occur in the brain, testicles, muscles, or almost anywhere in the body. Two situations where they are by no means rare are the larynx (or voice-box) and the rectum or lower part of the bowel. In these places they may eventually produce serious contractions, or strictures, the relief of which would necessitate a surgical operation.

We may now briefly notice **Hereditary Syphilis**. Very commonly if a woman conceive a syphilitic child she aborts (or miscarries) at about the fifth or sixth month. Should the child be born alive, however, it usually shows no trace of the disease until from a fortnight to six weeks after birth. Then the child begins to lose flesh, the skin often gets loose, and the characteristic "snuffle" occurs, eruptions and sores appear, especially around the mouth and anus, and unless proper treatment is resorted to, the child may die. If the child is actually *born* with the disease, that is, born with snuffles and sores, &c., it usually dies. As the child grows older the taint usually makes itself evident in the general debility and stunted growth, in the sunken nose, or defective palate, and very often in the malformed teeth. When it reaches puberty, inflammation of the eyes (see Diseases of Eye) and deafness are common.

A child may escape all the earlier symptoms of inherited syphilis and may yet fall a victim to the late ones, especially the inflammation of the eyes.

It may be asked, a person having contracted syphilis, what is the outlook? To this we reply, with certain reservations, *good*. The reservations for the most part are as to the person's constitution. If he is consumptive, or the subject of Bright's Disease, the disease will go harder with him than others. Secondly, as to treatment. This must be thorough, carried out for a sufficiently long time after the active disease has ceased, and during this time the patient must live a healthy life.

Treatment.—We must consider this under two heads: (i.) *preventive*; (ii.) *curative*. The first, as always, infinitely the most important.

Irregular sexual intercourse has existed for all ages, and however moralists may preach against the practice there seems no hope that the case will ever be different. All attempts to deal with this social question have proved futile, and thus since it is so intimately mixed up with it, has the question of the prevention of venereal disease.

There are two ways of preventing this evil, the personal and the administrative, and at present the only one at our command is the former. With the increasing difficulty of the struggle for existence marriage is often quite out of the question for many years after the marriageable age is reached, and yet the passion may be most assertive. However proper and natural these may be, the exigencies of civilisation demand their restraint, and if not, then the penalties that are exacted are frequently great indeed. This morality has been preached, by all who have had the care of the health of the community, for centuries, and with but little effect; Nature still asserts itself, and brushes aside all the artificial restrictions of civilisation. The only other means is the administrative. A complete and rigid State regulation of prostitution, with isolation, &c., thoroughly carried out, is the only efficient way, but public opinion, especially of the English-speaking race, is decidedly averse to it; and even when this was undertaken on a small scale for our army system, raised such a storm of opposition that it was discontinued by a repeal of what was called the Contagious Diseases Act. The consequence is, that both at home and abroad our soldiers and sailors expose themselves without let or hindrance to the most virulent types of the disease, and the wastage in efficiency from this cause is a serious question of national economy. But this is not all; these infected men when they return to their homes infect others, and so the evil goes on. If it were only the offender who suffered, then we could perhaps afford to

ignore the question; but, unfortunately, only too commonly the lives of innocent wives and children are ruined and rendered unutterably miserable by this dire disease, and however difficult the solution, however those who shut their eyes to all the misery entailed may cavil, it seems that it is undoubtedly a question that requires a solution from the legislature of the country, not on behalf of the libertine and debauched, but on behalf of the innocent ones who have to bear the cross.

The Curative Treatment.—Syphilis is a disease that is best treated by a physician, and only where this aid cannot be obtained should self-medication be resorted to. Avoid, as deadly, all *quacks* who advertise cures for the disease.

The only medicines of any avail are mercury in the primary and secondary stages, and potassium iodide in the tertiary stage. The former is usually given in the form of the mercury and chalk powder or pill, one grain three times a day after food. Mercury must be continued, with occasional intermissions, for at least a year *after all symptoms have disappeared*. The precautions to be taken whilst undergoing a course of mercury are: Stop it as soon as the gums get sore, or, if biting causes pain, until this subsides. Keep the mouth perfectly clean with a tooth-brush, or if sore use a mouth-wash of chlorate of potassium, one teaspoonful to the pint of water.

The general health must be carefully attended to by attention to good hygiene, proper and plain food, scrupulous cleanliness, warm clothing, &c. Moderation in the use of tobacco and alcohol is of the utmost importance in this disease; excess in this respect will render useless all treatment and open the way to great ravages on the general health. In the tertiary stage potassium iodide, beginning with five-grain doses three times a day, and gradually increasing them, is the treatment.

When it can be afforded, residence at such spas as Aix-la-Chapelle is often attended with the most gratifying results, especially where the disease is not reacting to treatment very well.

Before leaving this subject we must briefly refer to the question of syphilis and marriage. We take it that no self-respecting man would marry when he had any *obvious* signs of the disease. We mean obvious to himself. Unfortunately, however, the danger to the issue does not end there, as will be readily understood by any one who has read carefully what has been said above, and we would lay it down as an absolute rule that *no person who has had syphilis should marry until a year has elapsed since the disappearance of all symptoms*, and not even then unless proper mercurial treatment has

been undergone for a sufficient length of time. This means, as a rule, that marriage is not permissible until about two and a half years from the date of infection.

Soft Chancre.—There is another venereal disease which is known as *soft chancre* to distinguish it from the *hard chancre* of true syphilis. It differs from the latter in that the poison does not affect the general health in the way that syphilis does, and it is not followed by any of the constitutional symptoms.

Symptoms.—About a week after infection one or more sores or ulcers appear on the penis, under the back part of the prepuce usually. These do not become hard like the sore of syphilis, hence the term *soft chancre*. In a little time there usually appears a swelling or *bubo* in the groins, and this is very apt to go on to an abscess.

The point is, that the sore *appears about a week after infection*, whereas the sore only appears after a considerable interval if it is true syphilis; but no one can possibly tell that it may not go on to become a hard chancre until a month has elapsed, for the two diseases may have been inoculated at one and the same time.

Treatment.—It is only necessary to treat the sore, and scrupulous cleanliness and protection from irritation are the most important things. Iodoform should be dusted on to the sores after each cleansing. If buboes become abscesses these must be fomented until they burst, or they may be opened by the surgeon. If instead of healing the sore becomes hard, and is followed by secondary symptoms such as a rash or sore throat, then the case is true syphilis, and must be treated accordingly.

Gonorrhœa.—This is a disease which is characterised by a discharge of matter from the penis, and is due to infection with a germ which is technically known as the “*gonococcus*.” It is transmitted by sexual intercourse of the affected persons.

Symptoms.—These are usually divided into three stages.

The *first stage* dates from a day or two (commonly the third day) after infection, and one of the earliest symptoms is itching at the end of the penis. This is quickly followed by a pale yellowish-white discharge. This lasts for a day or two, and then the disease assumes its typical symptoms in the *second* or *acute stage*. The discharge becomes yellowish-green and more profuse, there is a frequent desire to pass water, and intolerable pain in doing so. The lips of the opening in the penis swell and look very red, and the patient often looks ill and worn out from loss of sleep. Painful erection of the penis, or *chordee* as it is called, often is most annoying just as he gets warm in bed, and, in bad cases, is often the most troublesome symptom. Gradually the symptoms ameliorate, and the disease may go into the

third or chronic stage, frequently called "gleet." In this the discharge is thin and watery, and there is no pain on passing water.

We may now pass on to consider some of the complications of gonorrhœa. There are many, but fortunately most are rare; others, however, occur with considerable frequency, and it is these that we shall briefly touch on.

Inflammation of the prepuce or foreskin is common, especially in those who have long prepuces. It is due to want of cleanliness usually. It is not serious in itself, but is a source of much discomfort and irritation.

Chordee, or painful erection of the penis, ensues, and the organ then assumes a curved shape.

Bubo and Abscess in the groin are more frequent where sufficient rest is not taken. It is due to inflammation of the glands in the groin, and they not uncommonly subside without forming an abscess.

Complete inability to empty the bladder is sometimes caused by the inflammation in the tube being so intense as to block it up. This occurs more frequently where there has been a previous attack of gonorrhœa, with perhaps some slight narrowing of the tube from contraction. *Stricture* may occur, especially in cases which have dragged along for some time or perhaps been improperly treated.

Before going on to the treatment we may just remark that, although the germ most frequently attacks the mucous membrane lining the penis, it can set up a similar inflammation in that lining other cavities of the body. One of the most deadly spots is the eye, for if the inflammation occurs there it not infrequently leads to complete blindness. Therefore it is exceedingly important for both sexes to remember this, both for their own sakes and that of others, and take the necessary precautions. In this connection we must refer to the paragraph in the section "Eye Diseases" under the heading "Purulent Conjunctivitis."

Gonorrhœa in Women attacks the entrance to the vagina and then extends up that canal, and also to the opening into the bladder. It was at one time thought that gonorrhœa in women was a particularly mild and unimportant disease, but we know now that it is really a far more serious complaint in women than men. It is so for the following reason. The inflammation is liable to spread upwards into the womb and thence into the tubes that open into the belly cavity, and then a long series of troubles may arise. These tubes sometimes get permanently blocked up (and thus gonorrhœa is a frequent cause of sterility in women), or they become full of matter, and may eventually need an operation, or may cause death from peritonitis.

Treatment.—*In Men*, where possible it is advisable to get

absolute rest in bed for a few days. If the bowels are not quite regular take a seidlitz powder every morning, let the diet be light and contain no meat, and there must be absolute abstinence from alcohol in all forms. Soda-water and lemon-juice may be freely taken, also barley-water or milk and soda. If absolute rest is impossible exercise should be reduced to a minimum, and a suspensory bandage used to support the testicles, as this diminishes the risk of their becoming inflamed. Injections should not be used as long as there is any pain, and one of the best mixtures to take is: Bicarbonate of soda, 2 drachms; tincture of hyoscyamus, 1 drachm; infusion of buchu, 1 ounce; water up to 8 ounces. Two tablespoonfuls of this mixture should be taken every six hours as long as there is smarting on passing water. If chordee is present a large injection of warm soapy water (about one pint) into the bowel, followed by a hot bath, will often secure a night's rest. If it does not, then 15 to 20 grains of bromide of potassium taken in a wineglassful of water should be taken. As soon as the feverish symptoms have subsided and the pain has diminished the time has arrived for injections and copaiba. One of the best injections is permanganate of potash. Begin with 1 grain in 4 ounces of warm water, and this may very gradually be increased up to 1 grain in 1 ounce. Before using the injection it is best to pass water in order to flush out the tube, then with a proper syringe slowly inject two or three teaspoonfuls, and grasp the end of the penis for two or three minutes to prevent its return. This procedure should be repeated four or five times a day until the discharge lessens, when it may be done less frequently, but it should be repeated night and morning for some days after all discharge has ceased. In the meantime the following mixture should be taken: Balsam of copaiba, 2 drachms; spirits of nitre, 1 drachm; solution of potash, 1 drachm; peppermint water up to 8 ounces. Take two tablespoonfuls three times a day. (*Note.*—This mixture occasionally brings out a rash.) The treatment usually lasts about three weeks to a month.

In Women the disease is treated on similar lines, except that the injections are made into the vagina and not into the opening of the tube from bladder. It is best before using the injection to well wash out the passage with two or three pints of warm water. On account of the extreme importance of the subject we here repeat the following rules to be observed by all sufferers from gonorrhœa:—

1. All sexual intercourse must cease until the cure is complete.
2. If there is a "gleet" this is just as contagious as the thick discharge.
3. All towels and washing materials must be kept separate from other occupants of the house.

4. Scrupulous cleanliness is essential.
5. Always wash hands after handling the penis, and *mind your eyes*.
6. If the disease occurs in a pregnant woman, remember to see that the baby's eyes are carefully cleansed when it is born. (See Diseases of the Eyes.)

The above description of the treatment is not intended to induce people to treat themselves; it is only intended for those who are from various reasons left to their own resources. It is always wise to consult a good doctor, and to put aside all ideas of false modesty.

SECTION VIII

THE FAMILY MEDICINE CHEST

A HIGHLY important department of the healing art is that which includes the administration of drugs or medicines. Naturally it requires a special scientific training in order fully to appreciate and understand, not merely the qualities and preparation of drugs, but likewise, in the case of the physician, the special action which each drug is calculated to exercise on the body. Nevertheless, in a treatise of this kind it is possible to give certain details regarding the drugs in more common use, such as may enable the reader intelligently to appreciate their qualities and actions in the treatment of disease. One or two points are necessary to be understood before proceeding to the discussion of drugs and their actions. A very common, but erroneous, idea connected with the administration of medicines is that which supposes that, in all cases, a drug which is used for the cure of disease acts by driving some disease principle from the body. The sections of this work devoted to the examination of diseases and their nature will fully show the reader that no such idea of the use of any drug is permissible. That which a medicine accomplishes is rather the modification or alteration of a disease process, and the substitution therefor of a more healthy state of matters. To the general subject of treatment of disease at large the name of *therapeutics* is given, this department of medicine showing special applications to each disease the physician is called upon to treat. There are two chief phases connected with the action of drugs on the body which require to be duly borne in mind. In the first instance, we require to study what is called the *physiological action of any medicine*; that is to say, the effect it produces on the

healthy body. In the second place, we must investigate its action *on the body in disease*. We require to study each drug from both points of view before we can be said perfectly to understand its action. It is true that a certain amount of likeness exists between the action of many, if not most, drugs in the body in a state of health and in disease. Thus a dose of any aperient medicine taken by the healthy body will increase, naturally, the bowel excretions, and also have the effect of quickening the movements of the intestine. This result is also accomplished when the same drug is given, say, for the cure of constipation. In the former case its physiological action is illustrated, whilst in the latter case the same action comes into play as curative of a diseased state.

Varieties of Treatment.—With reference to treatment of disease, it has already been shown in many parts of this work that a large number of agencies, other than drugs, are employed by the physician in his curative work. *Heat and cold*, for example, represent valuable methods of combating diseased action, whilst *the selection of proper foods* (as in scurvy, fever, and the like) forms another and most important aid in the work of the physician. *Blood-letting* by means of leeches or cupping, and the actual removal of diseased parts at the hands of the surgeon, also fall to be included under the wide name of “treatment.” Regarded from another point of view, we find that the treatment of disease may be either of a direct kind, as in the case last mentioned, where a tumour is removed by the surgeon’s knife; or it may be of an indirect kind, as, for example, where, through the administration of special medicines, such organs as the heart or kidneys are acted upon by way of curing some general condition affecting the body, such as is illustrated by the case of dropsy.

Natural and Empirical Treatment.—Yet another mode of regarding the treatment of disease is that which recognises that two modes of curative measures may be employed. The *rational treatment* of disease may be said to represent the truly scientific side of medicine, because the physician, from his knowledge of the causes of disease, understands more or less precisely what is required for cure, and the special action on the diseased state or condition which a drug or combination of drugs may exercise. The action of quinine, for example, in curing ague and other malarious troubles, is perfectly understood, because we know that quinine passing into the blood acts fatally on the parasites which cause the disease. Equally certain is the action of such a drug as digitalis on the heart. We know experimentally and otherwise that digitalis exercises the effect of a heart-stimulant, and the physician therefore selects it in many cases of

heart trouble on account of its exerting the influence in question. It need hardly be said that the highest aim of medicine is to place all treatment of disease on a rational basis. In other words, the progress of science aims at the complete understanding of the causes of disease and of the action of drugs in modifying diseased processes. If medicine were a perfect science and art, these two points would be made clear regarding every ailment. As it is, however, the progress of science, rapid as it has been, has yet to encounter many dark places for illumination. Hence the second phase of treatment presents itself to us in the shape of that which is termed *empirical treatment*. In this latter case the physician leans on the *results of experience* without of necessity being able clearly to explain the exact action of the drugs he employs. One might perhaps more legitimately describe this latter mode of treatment as *the experimental method*, seeing that it is built up on a foundation afforded by the practice of experiments in the way of administering drugs which through a long course of years have been found to exercise certain effects. If definite results are known to follow the administration of certain drugs in the case of a particular disease, the physician relies on the "empirical method"; that is, if it so happens that the cause of the disease is unknown to him, or otherwise that the action of the drug on the disease is not clearly understood. In the case of mercury, which is administered as a specific and certain cure for *syphilis*, this drug illustrates that one we have termed the "empirical method." We know that, properly administered for a lengthened period where the system has become affected with syphilis, mercury has the power of arresting the disease, and of preventing its development into the serious form it assumes when no treatment or an imperfect mode is adopted. All we can say at present regarding the action of mercury in this serious disorder is that long experience has taught that, in some fashion or other, mercury exercises an effect on the diseased principle (whatever that may be represented by), and, in all probability, also modifies the tissues against the extension to them of the disease products.

Drugs and Quackery.—In the same way, if we suppose that, as the result of a syphilitic attack, a man suffers from a certain variety of brain tumour, we know, as the result of experience, that the administration to him of iodide of potash will usually dissipate the tumour. We are unable to explain precisely how the drug effects this much-to-be-desired end. None the less is its value demonstrated, because we are unable to account for its intimate action on the growth in question. It may be said that one of the chief distinctions to be drawn between what is popularly known as quackery and the practice of scientific

medicine, relates to the marked difference in the method of cure practised by each system respectively. The quack in many cases does not even appeal to the results of experience. He is accustomed boldly to advertise his wares as capable of curing any and every diseased state. That any one drug or combination of drugs should exercise the powers of a universal panacea is, of course, an utterly unreasonable supposition; but it is thoroughly represented by the practice of the quack, who, in his advertisements, claims that his medicine will cure diseases varying greatly in nature as do cancer and paralysis. It is needful here to enter a strong protest against the ways of the quack who floods newspapers and journals with his advertisements, and who not merely induces people to spend money uselessly on a remedy which cannot afford relief, but, in the case of serious disease, also induces his dupes to lose valuable time in respect of the treatment of the ailment by a competent medical man. There is no stronger argument for the education of the public in a plain knowledge of the more common facts relating to medicine and disease than the consideration that such knowledge would save them in many cases from the "tender mercies" of the quack. Nowhere are the lamentable results of quackery better displayed than in the case of so-called "cancer cures." Admittedly cancer is a disease of the exact cause and origin of which we are at present unaware, although research is being actively pursued by science with the view of determining the source of this great physical evil. Notwithstanding our admitted inability to explain the nature of cancer, the quack will boldly assert that his particular nostrum will cure the ailment. In place of being properly treated by surgery at an *early* stage of the disease, when alone the hope of cure is possible of realisation, the patient using the "cancer pastes," lotions, or other forms of medicament prescribed by the quack, misses, as we have seen, the only opportunity of relief.

Medicine, regarded from a scientific point of view, may experiment in the case of cancer with drugs, the properties of which are known. Careful watching of cases treated with such drugs at the hands of physicians is calculated at least to afford us information regarding the folly or the reverse of administering such medicines, but it is evident that this process of scientific inquiry, and the careful study of numerous cases variously treated, represents a very different method from that of the quack. We might, indeed, compare the practice of the quack to that of a person who rains bullets from a machine gun at a target, in the hope that one or more will hit the bull's-eye. The educated medical man, on the other hand, may be likened to him who shoots at the target with a rifle. He at least aims at

the mark, and his method is scientific and deliberate, and is moreover carried out with a fairly clear hope of arriving at the destined result.

The Action of Drugs.—It is evident from what has been said that, in the use of medicines, we must have regard not merely to the drug, but to the body itself, and to the particular organ or organs on which it is presumed to exert an influence. Hence it is, that, only after the body has been duly studied with regard to the structure and the functions of its various organs, can we hope to understand, even in a plain fashion, how medicines act upon the frame. It is only by founding our use of drugs on such knowledge that we can escape the reproach of Voltaire, who spoke of the practice of the physicians of his day as pouring drugs, of which they knew little, into bodies of which they knew infinitely less. An illustration of the important connection which exists between a knowledge of the body itself and the drugs used to cure its diseases, may be found in the case of the relations existent between the lungs, skin, and kidneys. These three organs, as has already been shown in the section devoted to their description, discharge much the same work. In other words, they are devoted to the function of *excretion*, or the getting rid of bodily waste, which represents the result of our bodily work. They excrete the same kinds of waste, but in different proportions, as regards the individual matters separated from the blood. If now we suppose that one set of these organs, say the lungs, is affected by disease, the rational mode of treatment in many of such cases is that of giving medicines whereby the skin or the kidneys, or both, may be stimulated to perform an additional amount of work. In this way the lungs are to a certain extent relieved. Where the kidneys are affected it is of high importance to ensure that the functions of the skin should be duly performed, medicines being given with the object of securing an efficient discharge of the skin's duties. In the same way a knowledge of the functions of the liver leads to the employment of different drugs in the cure of the various affections to which the liver is subject. We know precisely how the secretion and flow of bile may be stimulated by the use of certain medicines. Again, in the matter of purgative or aperient medicines, these do not affect equally the whole digestive system; certain of them possessing a definite action on one part of the bowel, whilst others affect another portion of the intestine. So also in the case of purgatives, we find certain of them to produce moderate bowel action, amongst these substances being included castor-oil, senna, sulphur, cascara, and magnesia. On the other hand, rhubarb and aloes will produce more active bowel action; whilst

jalap and croton-oil are purgatives possessing a very definite and powerful effect on the intestine.

The Nature of Drugs.—The sources of the drugs which are used for the cure of disease may be said to correspond with the three kingdoms of nature. In other words, man derives medicinal agents from the animal, the plant, and the mineral kingdoms. Otherwise, drugs may be regarded as derived from two sources, namely, an *Inorganic* source, that is from the mineral or non-living world, and, second, from the *Organic*, or living world, represented by animals and plants. Arsenic, antimony, bismuth, iron, lead, lime, and magnesia are familiar illustrations of substances derived from the inorganic source, that is, the mineral kingdom. On the other hand, digitalis, belladonna, strychnia, castor-oil, Indian hemp, squills, and the extract of male-fern (used in the treatment of tape-worm) represent prominent vegetable products. From the animal world we obtain such substances as pepsin, lard, spermaceti, cod-liver oil, honey, wax, cantharides (obtained from a beetle, and used for blistering), and leeches. It will thus be seen that all the kingdoms of nature are drawn upon in respect of the drugs used for the cure of disease.

Chemistry and Drugs.—It must here be noted that the advance of the science of chemistry has resulted in the production of a large number of useful drugs, obtained, in many cases, by building them up artificially from their elements. This process is termed *synthesis*. It is the opposite of *analysis*, which implies, of course, the taking to pieces, so to speak, of any substance by chemically dividing it into the elements of which it consists. Thus salicylic acid, used in the treatment of *rheumatism*, and prepared from the oil of winter-green, can now be artificially made by the action of carbonic acid on a heated mixture of carbolic acid and caustic soda, this mixture being decomposed by hydrochloric acid and thereafter purified. Owing to recent improvements in this art of building up in the laboratory, a large number of important substances, which otherwise can only be obtained from the plant kingdoms, are now at the disposal of the physician. In this way the list of substances included in what is called the *materia medica* has been of late years vastly increased.

The Forms of Drugs.—With reference to the various forms in which medicines are prepared, we find these, taken in alphabetical order, to consist of *Aceta* or “vinegars,” vinegar forming the mother fluid, so to speak, in which the drugs are dissolved. *Aquæ* or “waters” represent solutions generally of volatile oils contained in distilled water. *Chloroform water* represents a different kind of such preparation. What are known as *cataplasms* are familiarly

known as *poultices*; and *confections*, otherwise known as *conserves* or *electuaries*, are drugs combined with some sugary preparation of the nature of syrup or honey. *Decoctions* are preparations prepared by boiling vegetable matters in water. Most of them are of simple nature, the decoction of aloes being, however, an exception to this rule. *Emplastra*, or plasters, require no description. What are known as *enemata*, or *injections*, are used for procuring action of the bowels through their injection into the *rectum*, whilst, in another form, they may be employed for administering food by the bowel in cases in which it is impossible for the patient to take nourishment by the mouth. *Essences* contain volatile oils in spirit. *Extracts* represent either the juice of fresh plants or certain principles of dried substances. They vary very much in their nature according to the mode of preparation. *Glycerines*, as the name indicates, are preparations in which a drug is suspended in that substance, an excellent example being *glycerine of tannin*, of great service in the treatment of sore throat. *Infusions*, as the name indicates, are obtained from vegetable substances infused in water, cold or hot. The term *injection* is generally confined (as distinguished from the word *enemata*) to indicate the use of a drug in which, by means of a special syringe, it is injected into the skin. Morphia and other drugs are frequently used in this way. *Liniments* or *embrocations* are preparations intended for use by the method of rubbing or painting on the skin. Most of them contain oil, soap, and camphor. *Liquors* are solutions of drugs, in water or any other fluids. *Lotions*, otherwise known as *washes*, are used for external application, and represent solutions of drugs in water. *Mixtures* (*Misturæ*), as indicated by the name, may contain various substances which are not chemical compounds, but merely matters combined by rubbing different substances together; whilst *mucilages* may be regarded as matters partaking of a *gummy* nature. *Oils* represent a substance or substances dissolved in oil. *Pills* (*Pilulæ*) represent a form in which various drugs may be combined in small bulk for the purpose of easy administration. The special object of administering pills is that of securing the slow action of the drugs they contain. It is not needful to describe *powders*, seeing that this name is applied to any substance or combination reduced to a fine state of division. *Spirits* are solutions of substances in rectified spirit, which is of the strength of one to fifty. *Succi* or *juices* are obtained from fresh plants, so much spirit being added by way of preserving them. *Suppositories* are small, bullet-like objects composed of fats or other substances in combination with drugs. They are used by being introduced into the bowel, and, as they melt, bring their drugs in contact with any affected parts. The employment

of *suppositories* in the case of piles, forms an illustration of the use of drugs in this shape. *Syrups*, as indicated by the name, contain a certain proportion of sugar. *Tabloids*, which are lozenge-shaped bodies, varying in size, form an extremely handy mode of administering many drugs. These are manufactured by Messrs. Burroughs, Wellcome & Co., and as the quantity of each drug contained in a tabloid is accurately calculated, no mistake is possible of being made in respect of their administration. Various combinations of drugs, in addition to simple substances, are also made in tabloid form. As a rule physicians regard the tabloid as preferable to the pill, because it is more readily dissolved in the system. *Tinctures* may be described as solutions of drugs in spirit itself, or combined with other media. *Trochisci* or lozenges need not be specially described. *Unguenta* or ointments have as their basis lard or other fatty matter with which drugs may be incorporated. *Vapores* or *inhalations* are substances which when added, say, to boiling water, may be inhaled; otherwise, as in the case of the vapour of chloride of ammonium, used in many throat troubles, a vapour produced by special chemical means. *Wines* (*Vini*) are drugs contained in wine. Thus, *ipecacuanha wine* has sherry as its basis; whilst quinine wine has orange-wine as its foundation. In addition to the various forms in which drugs are administered we also find *eye-washes* (*collyria*) and *gargles*, the latter being used for the throat. What is known as a *linctus* is really a variety of "confection," which, dissolved in the mouth, is used in throat affections. Finally, what are known as *pessaries* represent preparations of the nature of *suppositories*. They are employed in many women's diseases, and are used by being placed in the vagina.

Weights and Measures.—Turning now to certain practical considerations connected with the use of drugs, we may note first of all the *weights and measures* used in the determination of medicines to be prescribed. With regard to weights, British medical men recognise certain "units," so to speak. These are the grain, the ounce, and the pound, the symbols for these respectively being "*gr.*," " $\bar{3}$," and "*lb.*" Taking the grain as the unit, we find that 437.5 grains make up one ounce (symbol $\bar{3}$), the pound being, in turn, composed of sixteen ounces or 7000 grains. In many cases it is found convenient to use a measure or weight between the grain and the ounce. This latter weight is termed the *drachm*, its symbol being " $\bar{3}$." The drachm equals sixty grains weight, and it is important to note that it does not therefore indicate the one-eighth part of the ounce as is the case of the fluid measures. A weight termed the *scruple* was formerly much used. Its amount is twenty grains, and its symbol is expressed thus, " $\bar{\partial}$."

Fluid Measure.—With regard to fluid measures, the unit is the minim (symbol "*min.*" or "*℥.*"). To this succeeds the fluid drachm, indicated, if necessary, by the symbol "*f 3.*" Then succeeds the fluid ounce (*f 3*), the pint (O), and finally the gallon (C). These measures, beginning with the minim, are related to one another as follows:—Sixty minims equal one fluid drachm, eight fluid drachms compose one fluid ounce, twenty fluid ounces make one pint, and eight pints equal one gallon.

It is useful here to note the relation which exists between weights and measures. Thus one minim is regarded as being the measure of 0.91 of a grain of water. One fluid drachm equals 54.68 grains of water, one fluid ounce equals one ounce, or 437.5 grains of water. One pint equals 1.25 lb., or 8750 grains of water. The gallon finally may be regarded as equalling 10 lbs. of water, or 70,000 grains of water.

The Metrical System.—What is known as the *metrical system*, otherwise termed the *decimal system*, is the mode of reckoning adopted by France and other Continental nations. It may be well for convenience sake to indicate the details of this system, and to compare it in respect of these equivalents with that in vogue in this country. The unit is the *gramme*, equal in English to 15.432 grains. The milligramme is 0.001 of the gramme, and equals 0.015 of a grain. The centigramme follows, representing 0.01 of a gramme, and is equivalent to 0.154 of a grain. The decigramme is 0.1 of a gramme, its weight in English measure being 1.543 of a grain.

In another fashion we find the English grain to equal in weight 6.479 centigrammes, or 0.064 gramme. Our drachm is equivalent to nearly four grammes of weight of the decimal method, or, to be exact, 3.84 grammes. Our ounce (avoirdupois) equals 28.349 grammes; whilst the ounce troy is equivalent to 31.103 grammes. The lb. avoirdupois represents 453.592 grammes. With regard to Continental measures of *length*, we find the unit to be taken as the *mètre*, which equals in English 39.37 inches. A *millimètre* is 0.001 of a *mètre*, the *centimètre* is 0.01, and a *décimètre* is 0.1 of a *mètre*. The *décamètre* is ten *mètres*, equal in English to 32 ft. 9.7 in.; the *kilomètre* is 1000 *mètres*, and amounts to 1093.633 yards. An English inch equals 2.539 centimètres; the yard is 0.9143 of a *mètre*, our mile being equal to 1.6093 *kilomètres*.

Finally, with regard to *measures of capacity*, we find the *litre* to represent 61.027 cubic inches, or 1.76 of an English pint. The English gallon equals 4.543 litres. The English cubic foot is equivalent to 28.315 cubic *décimètres*, and the English cubic inch to 16.386 cubic centimètres. One minim or one grain (English) may be

taken as representing 0.06 of a cubic centimètre or of a gramme; fifteen minims or fifteen grains practically equalling the gramme. One fluid drachm or one solid drachm may be regarded as equivalent to four cubic centimètres, or to four grammes solids. One fluid ounce or one solid ounce represents about thirty-two cubic centimètres or thirty-two grammes respectively. In measuring medicines abroad, we should bear in mind that a teaspoon will hold about five cubic centimètres, and a tablespoon about twenty cubic centimètres. Twenty teaspoonfuls, or five tablespoonfuls, are represented by a hundred grammes or cubic centimètres of water or other fluid.

THE CLASSIFICATION OF DRUGS

The means of distinguishing one kind of substance used in medicine from another depends naturally on the basis or foundation of the classification we employ. We may consider drugs as has been shown first of all with reference to their chemical nature. In this way they might be classified for example into acids, alkalies, and the like. A far more useful and practical method, however, for ordinary purposes is that of arranging drugs in groups according to their actions upon the body. It is not always possible to make a complete or satisfactory classification even from this latter point of view, because the same drug may exercise varying actions according to the dose in which it is given, and also according to other circumstances attending its administration. For popular purposes, however, this mode of classification is undoubtedly to be preferred to all others, for the simple reason that if a drug be classified according to its action we are all the more readily able to appreciate the particular uses to which it can be devoted. In a former portion of this section the attention of the reader was directed to the modes of administering drugs and to the various forms in which medicinal substances can be applied to correct disease action. Such a mode of classification may be conveniently studied along with that under discussion.

Blood Remedies.—A classification of a fairly simple nature is that which first of all includes drugs acting specially upon the *blood*. Here we meet with a class of remedies which, through their influence in producing some alteration or other in the quality of the blood, tend to affect the body at large. Examples of such remedies are found in “tonics” adopted to tone the blood, and to alter its constitution from a diseased or enfeebled state to that of health. Drugs of this kind are often known by the name of *blood tonics*, but alkalies and acids along with remedies known as *alteratives* also exert a distinct effect upon

the vital fluid. Taking first in order those substances which are intended to alter the quality of the blood and bring it to its normal state, we find first in order *iron* in various forms. Thus carbonate of iron, sulphate of iron, phosphate of iron, and dialysed iron all represent tonics in familiar use. Other blood tonics are found in the citrate of iron and ammonia, and citrate of iron and quinine, whilst to this list may be added such a substance as cod-liver oil and certain vegetable oils. With regard to the alkaline substances adapted to act upon the blood these drugs reduce the acidity of that fluid and increase its alkaline nature. Such substances as carbonate and bicarbonate of potash, the similar salts of soda, carbonate of lithium and of magnesia, lime water and charcoal, all represent substances which are used largely for the most part to correct acidity. The use of such drugs is exemplified in the simple case of indigestion (vol. ii.) accompanied by heartburn, and in more serious cases by their employment in rheumatism, gout, and other diseases. The group of *acids* and *astringents*, on the other hand, seem to affect an alteration in the blood, diminishing its alkaline nature to a certain extent, and probably also increasing a disposition to more ready coagulation or clotting. It is also probable that contraction of the blood-vessels, and a lessening of the secreting power of the membranes of the body, is produced by the administration of such acid and astringent substances. Vegetable acids represented by acetic, tartaric, citric, and tannic acids may exemplify the group of astringents. Mineral acids frequently used in medicine are represented by dilute sulphuric acid, dilute hydrochloric acid, and by others known as nitro-hydrochloric acid and phosphoric acid. In addition, certain acid vegetable matters may be used by way of astringents, their chief purpose being the checking or arresting of bleeding, or it may be the toning up of relaxed membranes, as in the case of relaxed throat for example. Thus we find catechu, kino, guarana, nutgalls (tannic acid), and even tea representing this particular group of substances. Other drugs derived from the mineral world have also to be considered in connection with their astringent action. Thus such substances as alum, sulphate of iron, the perchloride of iron, and sulphate of zinc are to be regarded as astringents. To these we may add oil of turpentine, creosote, carbolic acid, and ergot.

Other Blood Remedies.—Under the name of *refrigerants* we find included medicines the chief object of the administration of which is to relieve thirst in cases of feverish ailments. Water itself acts in this way, whilst citric and tartaric acids, and phosphoric acid, chlorate of potash and lemon juice, all represent this particular group. A very important class of substances acting on the blood includes those known as *antipyretics*. Here we find substances which by

Drugs and the Nervous System 135

experience we find to exert a power of apparently reducing blood pressure, and therefore bringing about a lowering of temperature in fever cases. Such substances as antipyrin itself, phenacetin, salicylic acid, salicylate of sodium, quinine, chloral, alcohol, aconite, and digitalis, represent the chief drugs of this kind used in medical practice. Other means of reducing the temperature are found in the shape of cold baths, bleeding, and the administration of purgatives and blisters.

Alteratives.—This class of blood remedies may be regarded as including many important and extremely useful medicines. By an “alterative,” we mean to indicate any substance which is capable through its administration, for a longer or shorter period, of correcting a general disease-tendency, and of practically assisting the blood itself, or it may be certain organs of the body, to return to a state of health. Preparations of mercury stand in the first rank of this particular group. The administration of mercury, for a long period, for the cure of constitutional syphilis represents the use of an alterative of a very well-defined character. Iodide of potash is also used to affect the constitution in the manner described. Arsenic also may be described as an alterative in at least one phase of its action, and antimony may be ranked in this group. Phosphorus and various hypophosphites, and more doubtfully probably such substances as sarsaparilla and dandelion may be regarded also as entitled to be included in the alterative class. The action of such drugs in many cases is ill understood. At the same time, as the result of experience, it is known that their administration tends to bring about a more healthy state of the blood, and probably through their action on the blood to affect diseased organs and diseased states.

Drugs and the Nervous System.—A very important part of the work of the physician is that of prescribing medicines or drugs with a view of affecting different parts of the nervous system. The classification used here leads us first to consider medicines which act more especially upon the *brain itself*, and upon what may be called the *central parts of the nervous apparatus*. Brain stimulation is effected by substances which have received the name of *exhilarants*. They range from alcohol in its various forms, to such substances as ether, chloroform, and opium, the last given in limited doses. A highly important class of substances acting specially upon the brain and the nerve centres are those known as *narcotics* or *soporifics*, whilst the term *anodynes* is also applied to such substances. Aconite may be described as a substance, the use of which is specially directed to the lowering of the temperature. In the case of the narcotics we find ourselves face to face with a class of *sleep-producing medicines*.

Those which more especially combine the two actions are found in the shape of opium and its various compounds, chloral, Indian hemp, and the bromides of potash, ammonium, and sodium. In addition, we find such substances as belladonna, atropine, and hyoscyamus acting as anodynes, and in all probability as serving to correct any irritable condition of the brain. What are known as *anæsthetics* are substances the vapour of which is capable of producing unconsciousness. Naturally such drugs are much used by the surgeon to abolish pain in the performance of painful operations, whilst they also may be given in various forms to allay pain and spasm, and also to procure sleep. Chloroform is the best known anæsthetic, but ether is also used. Nitrous oxide gas, or "laughing gas," is also employed largely in the practice of dentistry. Other substances may be applied locally to the skin to produce insensibility of a particular part, chiefly by a freezing action. Medicines which act upon the spinal cord chiefly may be divided into those which stimulate the cord and those which depress its action. Such substances as strychnine, phosphorus, opium, belladonna and Indian hemp, illustrate what we may call *spinal stimulants*. These are used in certain cases of paralysis, where the functions of the spinal cord are deranged. On the other hand, medicines which tend to diminish the action of the spinal cord are found in the shape of the bromides of potash, ammonium and sodium, whilst Calabar bean and conium or hemlock are also employed for this purpose.

Antispasmodics.—These drugs tone the spinal cord, and also correct any tendency towards spasm. One of the most frequently used remedies for this purpose is assafoetida, whilst valerian, musk, camphor, and the carbonate of ammonia, are also employed. In addition, a fairly large number of substances may be used along with other drugs in view of their action on the cord by way of relieving spasm. The bromides already described are so used, and we find belladonna, henbane, Indian hemp, and opium, also prescribed for the purpose indicated. The *nervous system* at large has a special set of "tonics," the action of which is devoted to bracing it up and giving tone. General tonics of the nervous system are found in the shape of strychnine, compounds of iron and the like, whilst it may be added that where any condition exists indicative of what may be termed intermittent disease affecting the nervous system, quinine and its derivatives and arsenic may be regarded as representing this particular division.

Heart Drugs.—Like the nervous system *the heart* is found to be affected very definitely and in different ways by certain drugs. We thus find substances which act as stimulants, especially on the heart and larger blood-vessels. Alcohol has a distinct effect on the

heart itself, as also have such substances as carbonate of ammonia, camphor, assafoetida, and valerian. Where the smaller blood-vessels have to be affected physicians are accustomed to prescribe citrate of ammonia, guaiacum, and like drugs. On the other hand, where need exists to quiet the action of the heart, we find digitalis, aconite, colchicum, hydrochloric acid, Calabar bean, and strophanthus, to illustrate what may be called the sedative heart remedies. Where the blood-vessels have to be slowed down in their action, so to speak, ipecacuanha, ergot, and nitrite of amyl are employed. Heart tonics are represented by the preparations of iron and also of digitalis. It may here be said, however, that the remedies we have mentioned as tonics affecting the body at large also may serve the purpose of heart stimulation. Digitalis, which has been described as a sedative to the heart, given in certain doses is known to act as a tonic when prescribed in smaller doses.

Drugs and the Digestive System.—Considering the number of diverse organs engaged and the different actions exerted by them in the digestion of food, we may readily understand that the drugs which act upon the digestive system must be numerous and varied. In the first instance, we discover medicines which are called *sialagogues*. These substances excite the salivary glands of the mouth to action. A common example of a substance which produces an increased flow of saliva is mustard. Tobacco when chewed effects the same action. Preparations of mercury and iodide of potash, as well as a substance known as jaborandi, are also to be included as affecting the salivary glands in this way through their effect upon the blood. A second class of medicines affecting the digestive system are those known as *emetics*. These produce vomiting, and, as has been remarked in previous sections of this work, are used in cases of poisoning, or in any other circumstances in which it is desirable to rid the stomach of its contents. The sulphates of zinc and copper, mustard, and common salt, will produce an emetic action, as also will ipecacuanha and antimony.

Purgatives or Cathartics.—Here again we come upon a very long list of substances, including drugs affecting different parts of the digestive system, but used at large to produce increased action of the intestine or bowel, and thus to rid the digestive system quickly of indigestible matters. Simple purgatives are often known as *laxatives*. They seem to affect the intestine at large, their action not being of a violent character. Such substances as figs, prunes, treacle, honey, tamarinds, cascara, and manna, represent purgatives of this gentle order. Olive-oil, castor-oil, sulphur, and magnesia may also be included in this list. Allied to these we find purgatives which do

not possess a very marked action beyond increasing the action of the bowels without producing any increase of the secretion of the intestine. Thus rhubarb, cascara, aloes, senna and jalap, may be included within this latter class. More powerful purgatives which irritate the bowel and increase the secretion of the intestine are found in the shape of jalap, in certain doses, scammony, colocynth, and croton-oil. This last is an extremely powerful purgative, the dose being limited to one, or at most, to two drops. It is given where there is a necessity, as in the case of apoplexy, to produce rapid and free action of the intestine. Purgatives which act by producing marked free secretion of fluid from the lining membrane of the bowels are found in the shape of cream of tartar, elaterium, and gamboge. Such substances also act upon the blood supplied to the intestine, and in this way indirectly affect the liver. What are known as *saline purgatives* also tend to increase the secretion from the bowel itself, and to give rise to watery evacuations. The sulphate of soda, Epsom salts, or sulphate of magnesium, cream of tartar in a medium dose, phosphate of soda, and like substances represent the saline purgative order. Purgatives which in addition to producing increased movement of the bowel act upon the liver as well are known as *cholagogue purgatives*. These substances are believed to increase the flow of bile from the liver into the intestine, this action in all probability aiding the purgative effect. Thus calomel, grey powder, blue pill, aloes, and small doses of sulphur possess this action. It may be added that the use of *injections* or *enemata* and *massage* (to the abdomen) also tend to effect a like action. Many of these drugs are prescribed along with others by way of increasing their action. Thus strychnine is sometimes added to a purgative pill, in the view of increasing the action of the muscular layer of the bowel. On the other hand, belladonna, henbane, and other substances may be combined with a purgative by way of allaying any tendency to gripping.

Anthelmintics.—Under this name are included remedies affecting the digestive system by way of removing parasites, of which tapeworm is a familiar example. As has already been indicated in the section of this work dealing with internal parasites (vol. ii.) and their treatment, we find the oil of male fern, the oil of turpentine, korosso, and santonin are used as worm remedies. Purgatives are usually administered first in such a case by way of first clearing the bowel. The latter are represented by calomel, jalap, and castor-oil. Quassia and iron are used as injections into the bowel for the purpose of disposing of small or thread worms.

Stomachics.—By “stomachics” we mean to include substances which have a power of giving tone to the stomach. They are pre-

scribed, however, with a view of improving the state of the body at large, and in general of stimulating the stomach to discharge its functions in a proper fashion. The list of stomachics is a very large one, ranging from calumba, gentian, quassia, nitric acid (dilute), nitrohydrochloric acid (dilute), and hydrochloric acid (dilute), onwards to strychnine, cinchona, quinine, pepsin, pancreatin, aloes, and rhubarb. Yet another section of stomachic remedies are those known as *carminatives*. These are prescribed in cases where stomach pain exists, and where flatulence is present. Ginger, mustard, pepper, cinnamon, valerian, and like substances are generally combined with other drugs on account of the action they exert in allaying distention and stomach irritation. On the other hand, *sedative* medicines require to be prescribed in cases where the stomach is irritable. These form a very valuable class of drugs, and include dilute hydrocyanic acid, various preparations of bismuth, creosote, bicarbonate of potash, belladonna, henbane, and opium.

Drugs for the Breathing System.—The windpipe and lungs are organs which may be variously affected by certain drugs. If it is desired, for example, to increase the natural secretion of the nose, we find such a substance as tobacco in the shape of snuff producing an increased secretion. *Expectorants* have the effect of increasing the natural secretion of the bronchial tubes of the lungs and producing a favourable change in such secretion in cases of disease. Where a cough is particularly troublesome, and where it is desirable that the matter should be easily brought up from the lungs, expectorants are given. Carbonate of ammonia, squills, senega, benzoin, myrrh, and the like are commonly prescribed with a view to affecting the action in question, whilst ipecacuanha is another favourite expectorant frequently prescribed, especially in the case of children. Many substances are also used by way of *inhalations* to effect this end. Thus carbolic acid, iodine, or creosote added to hot water and the vapour inhaled exercises the effect in question. Where, on the other hand, it is desired to produce a soothing action upon the lungs and their structures, and to diminish the secretion of the bronchial tubes, opium may be prescribed, as well as conium or hemlock, belladonna, and hydrocyanic acid.

The Skin and Drugs.—Drugs which act upon the skin are termed *sudorifics* or *diaphoretics*. Amongst these drugs we find included citrate of ammonia and carbonate of ammonia, alcohol, ether, jaborandi, and guaiacum may be mentioned. The compound ipecacuanha powder (otherwise known as Dover's Powder) is often used in order to cause increased action of the skin in cases especially of severe colds. It need hardly be added that warmth applied to

the surface of the skin, or hot vapour and the drinking of hot fluids (e.g. hot tea), also act as sudorifics.

Kidney Remedies.—Amongst remedies of this class we find those known as *diuretics*. These tend to increase the work of the kidney, and therefore augment the flow of urine. Such substances as squills, tobacco, colchicum, juniper, copaiba, cantharides, alcohol, and also water taken in large amount, tend to promote the action in question, as also do certain purgatives such as cream of tartar. *Digitalis* also has this effect. Another class of remedies applied to the kidney do not so much increase the quantity of urine as affect its quality, such drugs being frequently prescribed, for example, by way of preventing the formation of gravel and stone. Chief amongst these latter remedies we find compounds of lithia, bicarbonate of potash, the citrate and acetate of potash, the phosphate of soda, borax, and some mineral waters such as Contrexeville waters, and those also of Vichy and Vals. In connection with the kidney we also find remedies given to act upon the lining membrane of the bladder and of the canal leading from it known as the *urethra*. Such substances, for example, as pareira, buchu, balsam of Peru, infusion of bear-berry, copaiba, cubebs, and turpentine are employed in conditions affecting the bladder and urethra, the three last being chiefly given in cases where the urethra itself is at fault.

Drugs acting upon the Generative Organs.—These first of all consist of substances called *aphrodisiacs*, which tend to stimulate the generative functions. Such substances as strychnine, phosphorus, Indian hemp, and opium in small doses exhibit the action in question, as also do such drugs as damiana and coca. It may also be said that all medicines which tend to tone up the system at large in the shape of tonics exert a like effect upon the generative organs. On the other hand, drugs called *anaphrodisiacs* exercise an opposite function in that they act as sedatives and calm or soothe the generative organs. The bromides of potash and ammonium and sodium and camphor and hemlock are usually prescribed to this end, whilst it is undoubted that tobacco, alkaline medicines, and sedative drugs at large also exercise this effect.

Medicines which specially act upon the female generative organs are known first as *emmenagogues*. These are administered with a view to increasing the flow of menstrual fluid. Such substances as ergot, savin, rue, and assafoetida are generally prescribed for this end, whilst quinine may also be regarded as acting in the manner described. Preparations of iron, aloes, and of colocynth, and, indeed, purgatives at large exercise an indirect effect on menstruation. *Ecboolics* is the name applied to substances which, on the other hand,

tend to cause the uterus or womb to part with its contents, although it must be said that the action of such substances is extremely varied. Ergot, digitalis, and savin are amongst the drugs most frequently given to produce uterine contraction. The latter class of drugs is apt to be used in a nefarious or criminal sense in attempts to procure abortion. Their action is, however, extremely indefinite, and it need hardly be said that under the law of the land it is a criminal offence for any drug to be administered with the end in question in view. In cases of difficult menstruation permanganate of potash is given with a view of producing a more natural state of matters in this respect. Where menstruation is excessive, on the other hand, various substances may be employed with the view of curing the condition in question. Ergot is used in this way, as also is *hydrastis-Canadensis*.

Drugs for the Eyes.—In the treatment of eye diseases two classes of drugs are as a rule used. Those which dilate the pupil of the eye are represented by belladonna, atropine, and henbane. On the other hand, the pupil of the eye may be contracted where necessary by the action of opium and Calabar bean. (See section on Eye-diseases.)

External Remedies.—In a previous section it has been noted that many remedies are applied directly to the surface of the body either by way of affecting the body through their irritating action (represented in the case of *embrocations* and *blisters*) or by their soothing action, represented by ice, aconite, cocaine, and the like. Those which are used to destroy growths (such remedies being known as *caustics* or *escharotics*) fall to be included under the head of external applications. Drugs applied for the allaying of pain and to aid the absorption of fluids are found in the shape of various *liniments*, of which the compound camphor liniment, chloroform liniment, mustard, oil and turpentine, iodine and the like are examples. Blistering is produced generally by the aid of cantharides (Spanish fly) or blistering fluid. Occasionally remedies applied to the skin and intended to affect deep-seated parts are employed. Thus nitrate of silver may be said to represent this latter class. Where, on the other hand, *sedative medicines* are applied to the skin the selection of such drugs ranges from belladonna, opium, hydrocyanic acid, onwards to creosote and carbolic acid. These tend to allay pain and to relieve irritation. On the other hand, where it is desired to produce a local action of the skin by way of preventing pain being felt in any limited area of the body's covering, aconite, menthol, ether-spray, cocaine, and ice may be taken to represent this latter class of remedies. *Emollients* represent substances which tend to soothe the skin and adjacent parts. Thus a hot fomentation represents a soothing measure, whilst

poultices made with bread or linseed, or oily substances of the nature of olive oil, lanolin, glycerine, and spermaceti also fall to be ranked under the head of emollients. *Styptics* have already been described in the section of this work dealing with hæmorrhage or bleeding. They are also used to check discharges from the skin. Such substances as tannic acid, gallic acid, catechu, alum, perchloride of iron and sulphate of iron, and also the action of cold, may be ranked in this category. The substances already noted as *caustics* are used for the purpose of doing away with growths connected with skin surface, or other surfaces of the body. These range from sulphate of copper and nitrate of silver (or caustic) to glacial acetic acid, carbolic acid, salicylic acid, nitric acid, arsenic, and other substances. It need hardly be said that the use of these caustic substances must be carefully supervised, inasmuch as carelessness in this respect may result in the destruction of healthy structures, as well as the diseased parts to which they are applied.

Antiseptics are substances which suspend the action of putrefaction or decomposition for a time. Carbolic acid, creosote, boracic acid, sulphurous acid, alcohol, common salt, and other substances may be used to this end. In the section of this work dealing with disinfection, the subject of *disinfectants* has already been discussed. It was shown there that a large number of substances termed *germicides* are only "antiseptics." Such substances as Izal, carbolic acid (used in strong solution), corrosive sublimate, and the like are true disinfectants; whilst on the other hand such a preparation as Condy's Fluid cannot be regarded in any sense as representing a reliable germicide, its action rather being that of an antiseptic than of a true germ-killer.

RULES FOR THE ADMINISTRATION OF MEDICINES

Duly noting the rules which should regulate the administration of medicines, we may, in the first instance, detail the list of what may be called domestic medicine measures. It is not recommended that these measures should be used in preference to the giving of drugs, according to the graduated measures represented by an ordinary medicine glass, on which are engraved signs indicative of the various amounts the glass is calculated to contain. Accuracy in the giving of medicines, not merely as regards time, but as regards quantity, is an important feature in the treatment of all disease. Therefore prescriptions should be so dispensed by the chemist (and, of course, so ordered by the physician), that in the case of a mixture, say of six

or eight ounces, a certain part, say a one-sixth or one-twelfth part, may be accurately administered at distinct intervals. In such a case the outside of the bottle would be marked, either by projections on the glass or by strips of paper gummed on by the chemist, thus indicating the accurate division of the contents of the bottle into the amount required for each dose. As we have remarked, where a specific quantity of medicine is prescribed, amounting to, say, a drachm or an ounce, a graduated medicine glass should always be employed. It is, however, probable that the popular mode of estimating the doses of medicines will continue to be employed.

Domestic Measures.—These “domestic measures,” as they are called, have general reference to the amounts which can be obtained in utensils, ranging from a teaspoon to a tumbler. It is very obvious, however, that as the sizes of these vessels vary in a marked degree, no accuracy is possible in the administration of medicines according to this method. Hence the caution may be repeated, that wherever it is necessary to administer a powerful drug, and where the dose of such drug has been carefully calculated by the physician, the graduated medicine glass should always be employed. If the chemist exercises necessary accuracy in compounding his medicines exactly, no less should the patient be given his doses according to a method ensuring that he receives neither more nor less than the physician intends should be administered to him. With regard to ordinary domestic measures, it may be assumed that a teaspoon will hold an amount of fluid about equal to one fluid drachm. The dessert-spoon’s capacity is estimated at two fluid drachms; a tablespoonful may be held to equal one half a fluid ounce; a wineglass, according to its size, may hold an amount which varies from one-and-a-half to two fluid ounces. A teacup is regarded as being capable of holding five fluid ounces, and a breakfast cup eight fluid ounces. Tumblers, like glasses, vary accordingly in size, but we may calculate that an ordinary sized tumbler will hold ten fluid ounces, whilst a large tumbler of the mineral water kind may very easily hold fifteen ounces or more. Where medicines are directed to be given in drops, we again meet with a liability to error in respect of the fact that some drops (or *minims*) are larger than others. If a medicine is ordered so to be prescribed, we may take for granted that care is required in its administration. The bottle in which it is contained should, therefore, be provided with a proper dropping apparatus, and especially is it necessary to exercise great care in the administration of medicines in this way to children.

Rules for Administration of Drugs.—Another important rule with reference to the administration of medicines, is that which

insists upon our recognising that the safety of the patient may depend, first, upon the *regularity* with which a medicine is given; second, that equal importance should be attached to the *times or periods* of the day at which the drug should be administered; whilst, thirdly, a caution equally to be observed is that which insists on *the special dose prescribed and no more* being given at one time. With regard to the regularity with which doses of medicine should be given, this feature is one of extreme importance, since many persons are inclined to complain that a special treatment is not doing good, when, in reality, the fault lies not at the door of the doctor, but in their own irregular mode of using the medicines he prescribes. For example, in the case of syphilis, it is necessary that mercury should be taken with great regularity for a certain period of time, in order that the effects of the drug may in due course counteract the disease action. If the dosage of mercury is irregularly carried out, the patient cannot possibly expect to receive the full benefit of the treatment. The physician, in such a case, relies on his directions being observed, so that a certain amount of mercury shall be conveyed into the system in a fashion calculated to benefit the patient. Similarly in the case of such an ailment as constipation, where a mild acting aperient has been prescribed to be used (such as the cascara) for a lengthened period, it is obviously improper to expect an improvement in the patient's state, if say, for a day or two the medicine is taken and then irregularity in its administration be illustrated. In the treatment of anæmia or "bloodlessness," the regular administration, day by day, of iron is necessary, so that any lapse on the part of the patient in respect of the regular taking of this tonic, can only result in the non-success of the treatment and the failure of the cure.

The Period of Administration.—With regard to the time of the administration of drugs, it must be confessed that a considerable amount of laxity is sometimes found even in the directions given by physicians, with regard to the exact circumstances (chiefly having reference to food and feeding) under which medicine should be taken. Here we have to consider the influence a drug or combination of drugs exerts with reference to the condition of the stomach. It would be obviously a highly improper proceeding to give certain medicines just before food is taken, or others just after food has been taken. On the other hand, certain medicines will only act properly when taken before food, others again being only administered after a meal. This, it will be seen, forms a highly important topic in connection with the use of drugs, and no medicine should be taken in the absence of a thorough understanding regarding the periods of the day, with reference to meals, at which it should be administered. A

Times of Drug Administration 145

few examples will suffice to show the main lines on which this particular point can be decided. For example, drugs which by their action tend to soothe the stomach, or to tone it up for its work (bismuth being an example of the first and quinine of the second class), should be administered before food, the time elapsing between its administration and the taking of a meal varying from half-an-hour to an hour. Drugs of the nature of alkalies, represented by soda, potash, and the like, given to correct, say, the acid conditions of the stomach, should not be taken immediately after a meal. The secretion of the stomach (*gastric juice*) is itself of acid character. Hence to give alkalies with food would be a proceeding tantamount to altering the natural composition of the secretion in question. Such medicines, therefore, are generally prescribed to be taken an hour before food, or from two to three hours after a meal. When it is desired that a medicine should be quickly absorbed into the blood, such drugs are usually given soon after a meal. In the giving of iron, for example, this drug is usually prescribed to be taken after food. Cod-liver oil, which in its way may be perhaps considered more of a food than of a medicine, is similarly administered at the close of a meal. Arsenic, one of the most valuable tonics, is always prescribed *after food*. In such a case we escape irritation of the stomach, which would ensue if the drug were taken in the empty condition of that organ, and we also secure its ready absorption into the blood with the food. It is, of course, obvious that sleep-producing drugs or *narcotics* must be given at bedtime or before it. They act naturally best when the stomach is empty, this latter feature favouring their ready absorption by the blood. It is obvious that to administer any sleep-producing medicine soon after the person has enjoyed a full supper, would be a proceeding calculated either to delay the process of digestion or to neutralise entirely the effect of the medicine. Sleep-producing drugs require to be very carefully studied as regards their action, for it is found that certain medicines of this class will only act after a considerable interval, whilst others produce their effects more quickly.

Personal Constitution and Drugs.—We have also to take into account one of the most important considerations connected with the administration of medicines regarded from a general view. The point in question has reference to the peculiarity of constitution, or, as it is called, the *idiosyncrasy* of the patient. Here no fixed rule can be laid down save that of experience. The quantity of a purgative, for example, which will affect one person in a marked degree may have not the slightest aperient action in the case of his neighbour. It may be found, for example, that a dose of opium capable of checking diarrhoea in one person effectively, may require

to be doubled in the case of another. It is the study of the individual patient and his personal peculiarities in the matter of drugs which form a highly important part of the doctor's work. The best aid which the doctor can obtain in settling this important question is that which can be derived only from the experience of a patient who has been intelligent enough and observant enough to know the action of drugs upon his constitution.

Returning to the question of the proper time for the administration of drugs, a highly interesting point is that connected with the administration of *purgatives*. Here we desire to effect not the stomach but the bowel. *Purgatives* should, therefore, always be given on an empty stomach. They should be taken at least an hour before a meal, or conversely, not within four hours after food has been taken. The rule laid down by the medical men is that a purge taken before food acts more effectively than when administered after a meal. So-called "dinner-pills" (duly noted in the section of this work dealing with digestive troubles) are those administered half-an-hour before the chief meal of the day. If we suppose such a pill to be taken some time after a meal, its effect is not nearly so marked. Some medicines are prescribed along with food. Thus the various preparations of *pepsin* and *pancreatin* are given by way of increasing the action of the gastric juice of the stomach on certain foods. Hence they may be combined with milk, and thus administered as part of the food, or they may be given in other ways immediately after a meal has ended. An excellent example of the high importance of attending to the food question, in relation to the administration of medicines, is that found in the case of remedies given for the removal of "Parasites" (vol. ii.) in the shape of worms affecting the bowel. In the section devoted to this topic, it has been shown how a remedy like the extract of male-fern can only act successfully in killing tape-worm when the patient has been made to fast for a certain number of hours before the administration of the drug.

Some Drug Actions.—Certain bodily conditions, or, as we may term them, habits, have also a large influence in modifying or increasing the action of drugs. Thus *opium*, in all its shapes and forms, is a medicine which must be administered *with the utmost care in the case of children*. Here we find the matter of *age* forming a highly important condition, modifying the body in so far as the action of the drug is concerned. In the next place we have to consider what is called the *cumulative action* of medicines. This term denotes the fact that, after the administration for a certain time of a particular drug, its action begins to be exemplified by a certain

amount of bodily disturbance, owing to the fact that it has, so to speak, accumulated in the body, with the result that continued ordinary doses give rise to, it may be, symptoms of poisoning. Mercury, for example, is a drug which illustrates this cumulative action. Hence, for a time, the physician suspends the administration of the medicine by way of giving the system, so to speak, time to clear itself of the drug. Another condition of importance is that represented by the term *toleration* in reference to drugs. Here again we enter the wide field of personal or individual constitution. It must be said that after a particular medicine has been administered for a prolonged period, the system naturally tends to become "tolerant." In such a case its effects are no longer definitely produced as when it was first administered. The physician here has to change the medicine, or to suspend its administration for a time. A simple illustration of "toleration" of a drug may be afforded in the case of tobacco. The boy's first smoke is generally succeeded by nausea and vomiting. Later on, if he persists in the smoking habit, he becomes, as we know, "tolerant" to the action of tobacco, so that a substance capable of upsetting the system in one unaccustomed to its use, ultimately produces no ill effect. In the same way physicians know that substances used for gargling the throat speedily lose their effect, and have to be changed in consequence. The case of a person who takes laudanum or morphia also unfortunately affords an excellent example of what is meant by the bodily habit we are discussing. The victim of this habit begins his career with small doses of the drug. These, soon losing their effect, are replaced by larger doses, and these latter, in turn, by still larger amounts; so that we may find the morphia drinker, in the course of his career, capable of taking at one time a dose of this powerful narcotic, such as is certainly powerful enough to kill a person not habituated to its use. Here we see the vicious influence of habit. Just as in the case where an ordinary medicine loses its effect through bodily "toleration," we may assign the particular result to the influence of a special condition of the body on the action of the drug.

Some Cautions.—A final caution regarding the administration of medicines is that which we have already noted to consist in the accurate observance of the dose to be given. It must not be thought because a medicine appears to be comparatively tasteless, that of necessity it represents a harmless substance. If we suppose a powerful drug to be administered three times a day in, say, a five-drop dose at each period, it would be an act of the most obvious folly to give a double dose under the impression that the effects of the drug would be more quickly produced and the disease symptoms thereby

more quickly modified. Great harm and danger to life can only result under such circumstances. Hence the importance of the public recognising that the action of most medicines is of a gradual character, and that all drugs should be taken in strict accordance with the directions given for their administration.

With reference, speaking generally, to the doses of drugs, we may recognise that each substance used exhibits first what may be called a *minimum dose* and, second, a *maximum dose*. The first represents the smallest quantity of the substance which can produce a definite effect. The second may be taken to represent the limits of safety in connection with the giving of the particular medicine. An interesting point is that which teaches us, with reference to the dosage of drugs, that many medicines act differently according to the amount given. Thus opium exerts various influences on the body according to the doses prescribed; whilst such a drug as rhubarb or alcohol itself exhibits similar variations in respect of the amount taken.

Age and Doses.—Naturally the question of *age* becomes a highly important one, in so far as regards the administration of medicines. It is an obvious truth that the dose intended for an adult would be entirely inadmissible in the case of a child. Physicians are accustomed to employ a simple formula by way of calculating the proportions to be observed between the doses proper for adults and children respectively. All doses, *except where specially stated*, are those intended for the use of adults. In ascertaining the doses for children, the proportion is usually calculated under the age of twelve by dividing the age in years by the age *plus* twelve. Thus if the case of a child of two years be taken the formula will be $\frac{2}{2+12}$. This equals $\frac{1}{7}$ ths or $\frac{1}{7}$ th, so that the dose will be one-seventh part of that intended for the adult. In the case of a child of three years of age the formula would be $\frac{3}{3+12} = \frac{1}{5}$ ths or $\frac{1}{5}$ th, the dose here being one-fifth of the adult amount. For a child of four years, $\frac{4}{4+12} = \frac{1}{8}$ ths or $\frac{1}{8}$ of an adult dose. In the case of a child of twelve, the formula runs as follows: $\frac{12}{12+12} = \frac{1}{2}$. When we come to consider cases of age between twelve years, and under adult life, the dose will naturally vary between half the adult dose and the full dose. Regard must also be had here to the fact that old persons, and also persons who are invalids, require to be specially considered in the matter of the doses of medicines prescribed to them. The same remark holds good in cases where special diseases are represented, and also in particular habits of the body. An excellent example of this latter fact is found in the case of certain kidney diseases. It would be a most improper proceeding in such cases to give large doses, say, of

opium, seeing that, owing to the kidney trouble, the drug would not be excreted or removed from the blood to the same extent, or in the same time, represented in the healthy state. On the other hand, in certain bodily conditions, and especially where great pain is present, large doses of a drug, such as morphia, which would act injuriously on the healthy body, may be borne without evil effect, and, indeed, may be required to be administered if any effect is to be produced at all. With regard to particular states of the system in relation to the giving of drugs, the best examples, having reference to the careful administration of medicines, are those found in the case of women. Thus the existence of menstruation may be found to modify seriously the action of certain drugs; whilst in turn certain medicines may interfere with the process in question. It is, for example, considered inadvisable to administer iron or quinine to menstruating women. Equally important is the condition of pregnancy; for it can be understood that a certain drug might have the effect, if improperly administered, of inducing abortion. A woman who is nursing her child in the same way requires to be carefully treated, seeing that her milk, affected by a drug, may cause serious disorder in the child.

Modes of Administration.—An interesting feature included in the consideration of the use of medicines is that which relates to the particular method of administration whereby their effects may be duly produced on the body. We have already noted that certain drugs exercise special actions on certain organs of the frame. The object of the physician in studying the particular manner in which a drug is administered is necessarily that of securing its prompt and efficient action. In the first instance, drugs are as a rule administered by the mouth in order to affect the mouth parts or throat itself, or they may be introduced into the stomach either for the purpose of affecting that organ itself or that they may pass from the stomach to affect the bowel, or that they may be absorbed from the stomach or intestine into the blood, and thus be conveyed throughout the body. There can be little doubt that this latter mode of administering medicines is effective in the vast majority of cases. Not only are certain substances quickly absorbed into the blood from the stomach (it is stated that iodide of potash can be detected in the urine twenty minutes after it has been swallowed), but another feature, that of the dissolving or solubility of drugs in the stomach is also here represented. An example of this latter fact is found in the case of calomel. This substance (a preparation of mercury) is only very slightly soluble in water. When, however, it is administered and passes to the stomach it is capable of ready absorption by the blood and may affect

the system powerfully through this latter peculiarity. The art of the druggist of late days has been largely directed to the rendering of nauseous medicines more palatable. Thus, in "tabloid" form, drugs can be swallowed with great ease. These "tabloids" are of great service to travellers, and also form the handiest mode of keeping medicines in a family medicine chest. The materials are of absolute purity, and the dose rigidly calculated. In other cases they may be enclosed in capsules, which, swallowed whole, are dissolved by the action of the stomach's secretion.

Medicines may be prescribed by the opposite extremity of the *alimentary canal* in the shape of *injections* (enemata) or *suppositories*. Thus an ordinary injection ranging in amount from a pint to a pint and a half injected into the bowel tends to induce bowel action, in the same way as a glycerine suppository placed within the bowel may be used for the cure of constipation. By the bowel also we can administer certain kinds of food when the stomach is unable to receive them. Suppositories used for the cure of piles represent another form of medication by the rectum or lower part of the bowel.

Inhalations calculated to bring vapours of various kinds in contact with diseased surfaces are now very largely employed with medicine in connection with throat and lung troubles. The smoke of medicated cigarettes, for example, brought down the nose forms a ready method of dealing with a cold in the head, and a solution of common salt sniffed up the nose has also been employed in this way. *Sprays* in which a medicinal substance is made to play upon the throat in a very fine state of division may be regarded as allied to inhalations, these last, however, being mostly represented by the inhaling of the vapour of very hot water to which medicinal substances have been added. Special forms of inhalers are now used for the convenient administration of medicines after the fashion just described. Some inhalers are of what may be called a chemical description, in that they supply a certain vapour which can be duly inhaled. One of the best examples of this latter mode of administering drugs is that represented by the *chloride of ammonium inhaler*. In this apparatus the vapour in question is generated by chemical action, and is used with good effect to remedy cold in the head, loss of voice, and the troublesome condition of the hinder nostrils, known as *post-nasal catarrh*. The *skin* is also used for the administration of medicines. Here a drug is rubbed into the skin, a certain amount of absorption taking place whereby the substance is conveyed by the blood to the body at large. Mercury can be made to affect the body by rubbing mercurial ointment into the skin. In the same way the skin may be first blistered and a drug absorbed by being placed on

the raw surface. Morphia is most frequently given to-day to allay pain by being injected into the skin. This is what is known as the *hypodermic* use of remedies. Many other drugs can be similarly used. The advantage of this latter method is that of obtaining the rapid effect of the drug, whilst disturbance of the stomach is avoided, as is apt to be the case when the drug is administered by the mouth. The injection of medicines directly into the blood is not commonly resorted to. In cases of great collapse, say, after extensive bleeding, saline or salt solutions are injected into the blood by way of reviving the patient. In a similar fashion transfusion of blood from the body of a healthy person to that of an exhaustive patient may be carried out. The most recent application of this direct mode of affecting the body is that which has been practised in the case of consumption, where injections of different substances have been made into the blood under the idea that their conveyance directly to the lungs may exert a favourable influence in arresting the disease. Other modes of administering drugs are those represented by the use of *liniments* which may either be painted on the skin or may be used as lotions or embrocations, which are rubbed into the surface of the body. *Gargles* and *eye-washes* (or *collyria*) also form distinct modes of applying drugs to diseased surfaces, and the same remark may be made of *poultices* or *fomentations* intended to raise the temperature of a part. We must also add to these modes of administering drugs the placing in the generative organs of the female of *pessaries* containing medicinal substances, whilst *injections* may be used equally in such cases, and also in the case of the male for the cure of discharges. The direct application to wounds of antiseptic solutions represents another familiar mode of the direct application of drugs for the cure of disease.

Prescriptions.—The *prescription* is the name applied to the order of the physician given to the chemist for the supply of drugs adapted for the use of a patient. The doctor is accustomed to write the prescription in Latin, following out an old tradition of the medical profession. Some practitioners, however, prefer to write their prescriptions in English. Probably the old method is the better of the two, inasmuch as the natural curiosity of the patient to know the substances with which he is being treated is, if gratified, not always calculated to affect his case satisfactorily. Besides, Latin forming still the recognised official language of the medical profession and of the druggist all over the world, it is better that a general medium or means of communication between the doctor and the chemist should be extant. At the top of the prescription the physician places the sign "*R.*" This sign in the old Roman days, no doubt,

represented an invocation to Jupiter. To-day it simply implies the Latin word *recipe*, meaning "take." Following upon this we find the ingredients of the prescription. It need hardly be said that the art of prescribing is one which can only be performed adequately by the physician trained in the nature and use of drugs in the quantities in which they should be used, and in their application to the special diseases he is called upon to treat. The doctor requires to have regard to the special circumstances of each case, and to make any combination of drugs he deems necessary for the relief of his patient. He has also to take into account the fact that the action of any particular drug he prescribes may require to be accelerated or modified by the use of other substances. Above all, he must avoid prescribing what are called *incompatibles*. In other words, he must take care that he does not prescribe drugs the action of one or more of which interferes with the effect of the others. Hence we find this fact giving us valuable information concerning the antidotes used in cases of poisoning. An example of this fact is found, for instance, in the case of opium and belladonna. To the action of belladonna, opium and calabar-bean are opposed. Hence belladonna is used as an antidote in cases of opium poisoning. In the same way it would be physiological folly to prescribe together two such substances as strychnine and chloral, seeing that the action of the one neutralises that of the other. A section of this work is devoted to making the reader acquainted with prescriptions used for the cure of various diseases; whilst throughout the work directions have been duly given with regard to the drugs or combination of drugs adapted to act as remedies in the case of each element considered.

Prescription Terms.—With regard to the other details concerning prescriptions, we may note that the signs, already indicated as representing the various weights and measures, are used by physicians. It may here be well to note further that the Latin term *misce* means mix. The capital S, or the word *signa*, abbreviated to "Sig.," indicates the directions which the chemist affixes to the bottle. The abbreviation "Ft." (Latin, *fiat*) implies the word "make"; "q.s." (*quantum sufficit*) means a sufficient quantity; "ad." means up to or to the amount of; the simple "c" is the equivalent of the Latin word *cum*, meaning with. The sign "aa" implies *Ana*, meaning take so much of each drug; whilst the letters "p.r.n.," equivalent to the Latin *pro re nata*, imply "as required" or "occasionally"; the simple "rep," means "let the mixture be repeated"; while "ss" implies *semi* or *semis*, meaning a half. It may be added, as has already been indicated, that the tendency of modern prescribing is to-day carried out much less in the direction of former

days (that of combining a large number of substances in a prescription) than in the way of simplicity in the use of drugs. Practical experience teaches us that, whilst certain combinations of drugs are absolutely necessary, the old-fashioned method of writing what was called "many-shotted" prescriptions, not merely possessed no advantage, but was apt to entail the neutralisation of one or more drugs by the action of the others contained in the physician's orders.

THE DRUGS MORE COMMONLY USED, THEIR ACTIONS AND DOSES

Having duly considered the various forms in which medicines are administered, and also the general classification of drugs according to their actions, we have, in the last place, to deal with the description of the drugs in more common use, and of those more especially fitted for the family medicine chest, this topic also including some knowledge of the nature and action of these substances and the doses in which they may be prescribed. Attention has already been drawn in a previous section to the importance of avoiding complicated combinations of drugs in the treatment of disease. Indeed, it may fairly be said that only the physician, trained as he is in a knowledge of the properties of drugs, in their dosage, and in the actions they may be expected to exert on the body, can satisfactorily prescribe drugs in combination. By far the most satisfactory mode of employing drugs in the home is that of using for the most part a single substance in each given case. We are not then liable to combine drugs which are termed "incompatibles," this term meaning drugs whose actions are so dissimilar, that the one tends to neutralise the other. In connection with the most convenient mode of administering drugs, previous reference was made to the "tabloid" system of dispensing medicines. The tabloid is practically a small lozenge-shaped body containing a definite quantity of a given drug. For the most part the drugs in common use are put up in tabloids each containing 5 grains of the medicine, hence it is extremely easy with this exactly graduated amount before us to prescribe the required amount. Bromide of potash, for example, sold in tabloids, and required in a dose of 20 grains, would necessitate the giving of four tabloids to the patient. In the ordinary way of dispensing, a powder weighed out by the chemist, and amounting to 20 grains, would be prescribed in the ordinary method of administration. One great advantage of the tabloid system is that the drugs employed are not merely of extreme purity, but may keep for any length of time and in any climate. It

may be mentioned, that in the late Sir H. M. Stanley's expeditions undertaken to Central Africa in search of Dr. Livingstone and to relieve Emin Pasha, the medicines of the expedition were contained in one of Burroughs & Wellcome's specially fitted medicine chests, this receptacle containing drugs mostly in tabloid form, such as an expedition of the kind would require. An illustration of one of these tabloid brand medicine chests is appended (Fig. 29). It is of air and water tight character, the contents comprising six 5 ounce and thirty 3½ ounce glass stoppered bottles of tabloid drugs. These are fitted in a movable tray, whilst the lid is made in two sections for the accommodation of dressings, bandages, surgical instruments, and other accessories. When fitted this chest weighs about forty pounds. A similar chest formed the medical equipment of the Duke of Abruzzi's expedition to the Pole. Certain

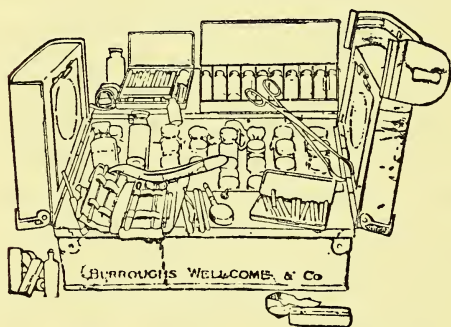


FIG. 29.—One of the Medicine Chests (Tabloid Brand) carried by the late Sir H. M. Stanley in the Emin Relief Expedition, and brought back as a souvenir—the remaining contents unimpaired.

substances are prescribed in tabloid form, but receive the name of "soloids." Such substances as boric acid, carbolic acid, nitrate of silver, permanganate of potash, sulphate of zinc, and other materials used for external application, or for making lotions and disinfecting solutions, are sold under this name. A great convenience is experienced in knowing, for example, that one "soloid" containing a disinfectant only re-

quires to be dissolved in so much water to make a solution of a particular strength.

Drugs and Doses.—It would be impossible in a manual of this kind to do more than describe the action of the drugs most likely to be of service in a household. For purposes of ready reference, the plan already adopted in the section of this work devoted to poisoning, namely, that of giving a list of substances in alphabetical order, will again be adhered to. *It is essential to note that the doses here given are those intended for adults.*

Acids.—Certain acids are used in medicine both for external and internal use. Thus *glacial acetic acid*, a very strong and powerful substance, is used for the treatment of warts. A very little of this acid is applied to the wart daily, care being taken that it is not allowed to come into contact with the surrounding skin. *Dilute acetic acid*, on the other hand, is sometimes given in water as a cooling and refrigerating medicine, and may be also used for the

stoppage of internal bleeding; dose, from half a fluid drachm to a fluid drachm in water. *Arsenious acid*, otherwise known as *white arsenic*, is of course a poison, but it is prescribed by medical men as a tonic, and is also used in the treatment of certain skin diseases. It is best prescribed in the form of the *liquor arsenicalis*, otherwise known as *Fowler's Solution*. The dose of those varies from 2 to 3 drops taken in water after food. *Boric acid* or *boracic acid* is used chiefly as an antiseptic. Dissolved in water, the dose would be from 5 to 15 grains. Of *carbolic acid* nothing need be said, seeing that its chief use in the hands of the public is that of acting as a disinfectant and antiseptic. It is occasionally prescribed in a pill, but requires to be very carefully used; dose, from 1 to 2 grains. *Gallic acid* is used as an astringent in bleeding, and also in diarrhoea, the dose of the powder being from 5 to 15 grains. Other acids are used as tonics. Thus *dilute hydrochloric acid* is a tonic and antiseptic, and is frequently prescribed in liver troubles. The dose in water, or some infusion of a bitter nature, is from 5 to 20 minims. Of *dilute nitric acid*, prescribed as a tonic either in water or in bitter infusion, the dose ranges from 5 to 20 minims. *Salicylic acid* reduces fever, and is also prescribed in rheumatism. The dose varies from 5 to 15 grains. *Aromatic sulphuric acid* is also occasionally prescribed as a tonic and astringent. It may be given in some bitter infusion; dose, 5 to 20 grains. *Sulphurous acid* (not sulphuric acid) is a useful preparation, most commonly used when diluted with water or with glycerine, or with both, as a spray or gargle for sore throat. If used internally as an antiseptic, or for the relief of stomach complaints, the dose given in water will vary from 20 to 30 or 40 minims. *Aconite* has been frequently alluded to in this work in connection with the treatment of fevers. It is given with the object of lowering the pulse and the temperature. The *tincture of aconite* is prescribed, the dose being 3 to 10 minims, but if it be given at short intervals to reduce the temperature, say every quarter of an hour during an hour or so, the dose must not exceed from 1 to 3 minims in water. Not more than 15 minims at the most of this tincture should be taken during three hours, unless ordered by the physician.

Alkalies are substances which represent the chemical opposites of acids. They are mostly used for the purpose of correcting acid conditions of the digestive system. *Bromide of potash*, *bicarbonate of potash*, and *bicarbonate of soda*, represent the chief medicines familiar to us under this head. They are frequently combined with some vegetable tincture.

Æther or Ether.—*Ether* is a substance much used as an anæsthetic, and also as a stimulant. It is mostly prescribed along with

the *compound tincture of cardamoms*, the dose being from 10 to 30 minims. This amount may be given if necessary after an interval. Only a passing reference is required in the case of *alcohol*. This substance is medicinally prescribed, not merely in the form of ordinary alcoholic beverages represented by brandy, whisky, and wines, but is also otherwise employed in medicines in the making of many substances. *Aloes* is mostly prescribed in the form of pill. Preparations of *ammonium* are extensively used. One of the most commonly used preparations is the *bromide of ammonium*, which is given as a sedative in whooping-cough, the dose varying from 5 to 30 grains. *Carbonate of ammonium* is an antacid and stimulant, the dose varying from 3 to 10 grains. *Chloride of ammonium* is employed in liver complaints, and also in neuralgia, the dose ranging from 5 to 20 grains. A useful and familiar medicine is that known as "Mindererus's spirit." This medicine represents a solution of the acetate of ammonia. It may be described in one sense as a family medicine, and is much prescribed in fevers to produce skin action, and also to stimulate the kidneys. The dose of the solution of the acetate of ammonia varies from 1 to 2 tablespoonfuls given in water every four hours. Mindererus's spirit is sometimes also used as an external application for bruises and inflamed parts. *Asafetida* is frequently prescribed in pills, especially as an antispasmodic in various digestive and nervous troubles. It is frequently thus given as a remedy in hysteria. The dose varies from 5 to 15 grains. Amongst the preparations of ammonium we must not neglect to include the *aromatic spirit of ammonia*, otherwise known as the *spirit of "sal volatile."* This last is extensively used as a stimulant, being frequently prescribed in nervous troubles. The dose in water will be from 20 to 50 drops.

Bismuth forms an extremely useful and much employed medicine. Its action is that of a sedative to the lining membrane of the stomach and digestive system at large. A number of preparations of bismuth exist. The *carbonate of bismuth* is given as a powder suspended in mucilage. The dose is from 5 to 20 grains. The *salicylate of bismuth* is also used to correct digestive acidity. The dose is that of the carbonate, whilst the *subnitrate of bismuth* used for like purposes is prescribed in the same amount.

Caffein is the active principle of coffee. It is used as a heart tonic, and is also given for the relief of headache. The dose is from 1 to 4 grains. A preparation of caffein is known as the *effervescent citrate*. It is given in water, the dose of this particular preparation ranging from 50 grains or more. *Camphor* is a family medicine, but one which requires to be cautiously used if it is prescribed internally.

In the form of *spirits of camphor*, it may be employed by way of inhalation for the relief of severe cold in the head. Its action on the body is that of an expectorant, and also a corrective of spasm. The dose of camphor itself varies from 2 to 5 grains. *Cascara* is a drug commonly prescribed for the relief of constipation. It is a favourite remedy because it does not exhibit any cumulative effects, and produces a gentle digestive action. The liquid extract is commonly used, the dose being from a half to one fluid drachm. *Cascara* is, however, more frequently prescribed in the form of the dried extract which is made into tabloids or pills and combined with other substances. *Chloral* is a medicine which belongs to the class of narcotics and sedatives. A word of warning should here be given to the effect that chloral should only be taken on the advice of a medical man, seeing that it possesses a very distinct action on the heart, and may therefore prove a dangerous drug. The dose of chloral varies from 5 to 20 grains given in water or syrup or combined with bromide of potash. *Copaiba* is a substance which is frequently prescribed in the case of discharges from the mucous membrane, and especially from the urethra or canal leading from the bladder. It is given generally in the form of emulsion, the dose being from one-half to a fluid drachm. *Cusso* (or *kousso*) is used as a cure for tape-worm. The dose given according to the instructions described in the article on parasites is from one quarter of an ounce to half an ounce. *Coca* is a substance which deserves mention in a list of drugs such as the present. It is a stimulant and tonic. The *liquid extract of coca* is frequently prescribed, along with *damiana* in cases of genital weakness. The dose of the liquid extract varies from a half to 2 drachms. *Damiana* in the form of the liquid extract is also given as a tonic along with the liquid extract of coca, the dose varying from 30 to 60 minims.

Digitalis is a very important medicine in the hands of physicians, adapted for the relief of certain heart troubles. Various preparations are used in medicine. The chief of these is the *tincture of digitalis*. The dose of this is from 5 to 15 minims given in water or combined with other substances.

Glycerines.—A fairly large class of drugs, including many of a familiar and useful character, are those known as *glycerines*. Thus we find *glycerine of boracic acid* used as an antiseptic, both externally and as an application to sore throat. In addition, we have the *glycerine of carbolic acid* also possessing antiseptic qualities, and *glycerine of tannin*, much used in cases of ulcerated throat. The *glycerine of borax* forms a useful application to sore nipples and excoriations at large. *Guaiacum* is a drug extremely useful in many diseased conditions. The *tincture of guaiacum* is, for example, a

remedy prescribed in ailments of the tonsils and in other conditions. The dose is a teaspoonful given in milk three or four times daily. This drug is also used in the treatment of certain varieties of chronic rheumatism. *Hamamelis* is an extremely useful drug, representing the product of the witch hazel tree of America. This substance may be prescribed in the form of the tincture, whilst under the name of "Hazeline" an extract is prepared from the bark of the tree. The tincture of hamamelis and hazeline itself are given for the relief of internal bleeding. The dose of the tincture is from 5 to 60 minims given in water. Hazeline, say in the case of internal bleeding, may be given to the extent of 15 or 20 drops every two or three hours in water. The ointment of hamamelis as well as the tincture are also extremely useful applications for checking ordinary bleeding, and are specially valuable as aids to the cure of piles.

Iodine in the form of the tincture is used as an application to enlarged glands. It is painted on the surface of the gland once or twice daily and allowed to dry, the effect being to produce a mild action of the nature of blistering, and thus to favour what is known as the resolution of the gland. Iodine also forms a substance used in the preparation of certain liniments. The tincture is also applied for the cure of ringworm. The chief salt or compound of iodine used in medicine is the very valuable preparation known as *iodide of potass*. This substance is typically an alterative; that is to say, one which is capable of producing such effects as might favour the substitution of a healthy for an unhealthy condition of body—as in syphilis, for example. The dose given in water of iodide of potash varies from 5 to 20 grains. It is variously prescribed for different ailments, and is most frequently administered along with some other substance of the nature of a bitter infusion. One effect of iodide of potash is that if used for a time it produces a condition of the lining membrane of the nose comparable to that produced by a severe cold, this condition being known as "iodism." *Ipecacuanha* forms one of the most useful of family medicines. As has been indicated in various sections of this work ipecacuanha not merely acts as an emetic. The dose of ipecacuanha wine used to empty the stomach varies from 4 to 6 fluid drachms. On the other hand, when the wine is prescribed by way of an expectorant in order to render the bringing up of matter from the lungs more easily effected the dose necessarily is much smaller, varying from 10 to 20 or 30 minims. Used in the bronchial troubles of infants the dose is, of course, proportionately less.

Iron.—No more useful medicine than *iron* exists in the physician's list. It is, of course, typically a blood tonic, and in the various sections of this work dealing with diseases and their treat-

ment iron will be found to be prominently mentioned as a remedy. A large number of preparations of iron exist. A much used preparation is the *tincture of the perchloride of iron*, otherwise known as *tincture of steel* or as *steel drops*. The dose of this given for anæmia or bloodlessness varies from 15 to 20 minims taken in water thrice daily. A more elegant preparation is that known as "Wyeth's Dialysed Iron." In this form the iron is equally effective as a blood tonic, and does not tend to injure the teeth. To avoid this latter result it is generally recommended that iron be taken through a tube. The *syrup of the iodide of iron* is also an extremely useful preparation, prescribed in cases of scrofula. *Phosphate of iron* is administered in cases of weakness of the bones in children. *Carbonate of iron* is prescribed in the shape of pills for bloodlessness, Bland's Pills being an example of such a medicine. It must be remembered also that iron enters into the combination of a considerable number of other preparations. Thus a tonic like *Easton's Syrup*, the dose of which is a small teaspoonful in water thrice daily after food, and the *compound syrup of the hypophosphites* both contain iron, and *Parrish's Food* or the syrup of the phosphates, given after meals in a teaspoonful dose in water to weakly children, has iron as one of its constituents.

Jalap is one of the most powerful purgatives at our command. The *compound jalap powder* is made up of tartrate of potash, ginger and jalap. An adult may take of this powder from 10 to 12 grains.

Lime is chiefly used in medicine in the form of lime-water, whilst the chloride of lime is also occasionally prescribed. To make lime-water, so useful in the feeding of infants by way of diluting the milk, it is only necessary to take 2 ounces of slaked lime, and place it in a stopper bottle holding a gallon of water. The mixture is to be shaken, and then allowed to settle. As much of the lime as has not been dissolved will have fallen to the bottom of the vessel, whilst the upper clear fluid represents the lime-water itself. This should be kept in a closely sealed vessel. A preparation of lime which is useful in certain cases is that known as the *sulphide of lime*. This remedy is occasionally prescribed in the form of solution in water for certain skin diseases, but its chief use is that of serving as a remedy which tends to cure boils, and likewise to prevent their formation. It is generally prescribed in the form of plain tabloids or combined with sugar of milk. A useful formula is that of mixing 24 grains of sulphide of lime with half an ounce of sugar of milk. This must be kept in a bottle with a stopper, the dose of the mixture being 5 grains taken in a little milk every four hours. As has been remarked this remedy is frequently prescribed for the cure of boils.

Magnesia.—*Magnesia* forms another of those substances which represent a well-known and useful family medicine. Various preparations of *magnesia* exist. All are practically antacids, and are therefore prescribed in acidity, and also in other cases where it is desirable to produce an alkaline condition of the blood. Of ordinary *light magnesia* the dose is from 30 to 60 grains dissolved in water. The *heavy magnesia* is given in the same dose. *Magnesia* is also given in effervescing form, in which latter shape it makes a cooling drink.

Mercury.—*Mercury*, like the iodide of potash, is an extremely valuable medicine, and is used like iodide of potash as an alterative. In the case of constitutional syphilis, mercury is invariably given as a specific in that disease, whilst in other forms it may figure as a purgative and a liver stimulant. The continued use of mercury produces profuse salivation, that is to say, its action induces an increased flow of saliva. Familiar preparations are found in the shape of *grey powder*, otherwise known as the *powder of mercury and chalk*. This is an extremely useful preparation, frequently used for the cure of diarrhoea in children and other like complaints. The dose is from 2 to 8 grains for an adult. In the form of *blue pill* or *mercurial pill* mercury is also used as a liver stimulant and also as a purgative. This pill taken in a dose of 2 or 3 grains will act on the liver functions. It is generally given in combination with other purgatives. For purgative purposes alone, the dose must be increased to say 10 grains. Other preparations of mercury are the *red iodide of mercury* and the *green iodide*. An extremely useful preparation which must be duly noted is that known as *calomel* or the *subchloride of mercury*. This preparation is taken to produce a purgative action, whilst it is also supposed to exert a certain effect on the liver. The dose as a purgative varies from 2 to 6 grains. What is known as "*Plummer's Pill*" is the *compound pill of subchloride of mercury*. This pill is prescribed on account of its alterative action, whilst it also appears to exert a certain action on the skin. The average dose of *Plummer's Pill* is about 5 grains. The *perchloride of mercury* is used chiefly as a disinfectant. It is a poisonous substance, and must be employed with care. Its use has been described in the section of this work dealing with disinfection at large. Perchloride of mercury is known by the common name of *corrosive sublimate*. *Blue ointment* is known as the *ointment of mercury*, and is sometimes used for the destruction of lice, whilst it is also employed by inunction into the skin to affect the system in syphilis. *Oleate of mercury* is a substance now frequently used in place of blue ointment because of its somewhat cleaner

nature and its readier absorption by the skin. Other substances are also employed in the shape of *oleates*.

Nitre or Saltpetre.—This substance is otherwise known as *nitrate of potash*. It is a substance which is variously used, being given to children in cases where there is much irritability of the bladder. As an application to sore throat, saltpetre is often found useful. Allied to this compound of potassium we find *chlorate of potash*, one of the most useful drugs in all diseases affecting the mouth, throat, and tongue. It may be prescribed in various forms in the shape of mixtures, but the handiest way of applying it is to allow a tabloid or lozenge of chlorate of potash slowly to dissolve in the mouth, thus bringing the drug in contact with the membrane it is intended to affect.

Opium.—Opium may be regarded as one of the three chief medicines used in the treatment of disease. It might very justly, in respect of its importance, be placed in the same category with mercury and quinine. Opium is mostly used as a narcotic or sedative, and it appears in the chemists' lists in very varying form. Thus ordinary opium itself may be prescribed as a pill, called the ordinary *opium pill* of the druggist. This pill is frequently used, especially in diarrhoea, and in other disordered states of the digestive system. The pills are, as a rule, made up each to the amount of 1 grain, the dose being duly repeated in four or five hours if no effect has been produced. Another useful pill into the composition of which opium enters is that known as the *pill of lead and opium*. This is frequently employed to check diarrhoea, the dose being one pill after each liquid motion, until three pills have been taken. *Laudanum* is the *tincture of opium*, and forms a useful mode for administering it in a fluid state. The average dose of laudanum given in water amounts from 15 to 20 minims. Opium also enters into the composition of that extremely useful powder known as *Dover's Powder*, otherwise the *compound powder of ipecacuanha*. This powder is most valuable in producing profuse perspiration, and therefore tends to relieve feverish conditions, and is especially useful in cases where a cold or chill has been sustained. The dose varies from 5 to 15 grains. What is known as *chalk powder* is the *aromatic powder of chalk and opium*. The dose here is from 10 to 30 grains. Opium also enters into the composition of *chlorodyne*, which is a valuable medicine adapted for the relief of diarrhoea, and also of many lung troubles. The dose varies from 10 to 20 drops in a little water. Chlorodyne has now been introduced into the official list of drugs. It is known under the name of the *tincture of chloroform and morphine*. *Morphia* is one of the derivatives of opium, much used

for the relief of pain and to produce sleep. Morphia may be given by the mouth or by hypodermic injections, that is to say, may be injected into the skin, in which latter fashion its action is more readily brought about without derangement of the stomach. Of the solution of morphia the dose varies from 10 to 40 minims. It should be noted that all preparations of opium are apt to be extremely dangerous in the case of administration to children, and to people suffering from any kidney disease.

Phosphorus.—*Phosphorus* derives its importance as a drug from the fact that in one form or another it enters very minutely into the composition of certain of our tissues. Among these latter brain and nerve may be included, whilst there can be little doubt that, apart from its forming a constituent of the body, phosphorus undoubtedly also exercises a definite action as a tonic. Phosphorus itself is not frequently administered, hence we find it combined with various substances, such as lime, iron, and the like. The *syrup of the phosphates*, already mentioned, illustrates a medicine of a tonic nature, used in the case of bone weakness as a general children's tonic.

Quinine has already been noted as one of the most important drugs in the category of the physician. It is thus largely used in the treatment of malarial fever, relapsing fever, and diseases of allied type. It is also given in ordinary fevers by way of affecting the temperature, and as a digestive tonic. *Cinchona*, from which quinine is derived, is a valuable drug. A useful preparation is the compound tincture of cinchona, the dose of which is from a half to 2 fluid drachms. Of quinine, we have the *tincture of quinine* and the *sulphate of quinine*. The latter is generally prescribed in the form of a pill, the dose being 2 grains. This pill acts as a tonic if taken before food. Other preparations are the *wine of quinine*, dose, a half to 1 fluid ounce; the ammoniated tincture of quinine, useful in influenza, the dose ranging from a half to 2 fluid drachms; whilst also there is the *citrate of iron and quinine*, a valuable tonic, the dose ranging from 3 to 10 grains.

Rhubarb is an extremely useful medicine, acting chiefly as a purgative. The *compound rhubarb powder*, better known as "*Gregory's Powder*," contains rhubarb, magnesia, and ginger. If rhubarb be given in a fairly large dose it acts as a purgative, whilst in a smaller dose it seems to exercise an astringent action on the bowels. Thus a dose of from 15 to 30 grains of rhubarb in powder will act as a purgative, whilst from 3 to 10 grains will probably exercise an astringent action. It need hardly be added that rhubarb enters largely into the composition of various pills containing other substances with which it is prescribed in order to increase its action.

Salicin.—*Salicin* has of late years come markedly into use as a remedy for rheumatic conditions, and also as a tonic. It is a substance obtained from the bark of the white willow tree. The dose of salicin itself varies from 3 to 20 grains or more. Salicin is often combined with various other substances for administration as medicine. Thus salicin and *salicylate of soda* represent a familiar combination frequently used for the treatment of rheumatic and other conditions. A substance known as *salol* may be mentioned here as an extremely useful drug in conditions of the stomach and bowels, where it is necessary to produce a disinfectant action. Salol is best given in the shape of tabloids, a single dose varying from 5 to 15 grains. Of *senna* little need be said, so familiar is this substance in the household. What is known as *black draught* consists of Epsom salts, extract of liquorice, infusion of senna, tincture of senna, and compound tincture of cardamoms. A useful preparation of senna is known as the *confection of senna*. It is specially valuable as a laxative for children. The *compound liquorice powder* contains senna, liquorice, and sugar. One or two teaspoonfuls taken in water or milk is the dose for an adult as a mild purgative, whilst half the quantity will form the dose for a child. In the case of pregnant women, in whom it is most undesirable to produce any violent action of the bowels, the compound liquorice powder will be found extremely useful. *Sulphur*, again, represents a homely and domestic remedy of much value. Sulphurous acid has already been described, whilst *milk of sulphur* (known as *precipitated sulphur*), and *flowers of sulphur* (or *sublimated sulphur*), are used as purgatives. Half a drachm to two drachms of either, given in syrup or milk, may be taken to ensure purgative action. A well-known preparation is *confection of sulphur*, used as a laxative. The dose will be 1 or 2 drachms once or twice a day. It is supposed to be specially useful in gout. *Sulphur ointment* is well known as a cure for itch.

Tar has long enjoyed a reputation, especially in the cure of skin diseases, although its virtues are not supposed to be limited by its employment in this direction. *Creosote*, which is obtained by the distillation of wood tar, may also be described under this heading. An *ointment of creosote* is employed in many skin diseases, whilst an inhalation of creosote is also used in connection with cases of consumption, bronchitis, and the like. Ordinary wood tar makes its appearance in *tar ointment*. *Oil of cade* is known as *juniper tar oil*, from the source whence it is derived. This ointment is used in many skin diseases, such as eczema. *Tar water* was strongly advocated by Bishop Berkeley as a remedy for a large number of diseases. Its use has practically been abandoned at the present day. With

regard to *turpentine*, we find *oil of turpentine* or *spirits of turpentine* used in medicine chiefly as a cure for tape-worm. The dose varies from 1 to 2 teaspoonfuls given in milk. Its action appears to be increased when a little castor-oil is added to it. The latter substance tends to produce rapid elimination of the turpentine from the body, and thus prevents the development of such symptoms as nausea, sickness, or even vomiting.

In addition to the common drugs thus prescribed, a very large number of remedies has of late years been placed on the market, produced, as has been mentioned in another part of this section, in the laboratories of chemists. Such substances as *antipyrin*, *phenacetin*, *antifebrin*, and *extracts* obtained from the various organs of animals, represent or illustrate such remedies. *Extract of thyroid gland* forms an illustration of the latter class of remedies. The mode of use of these substances will be found duly described under the head of "Diseases of Glands." In addition, we have to take into account other means for combating disease in the shape of what are called *antitoxins* or *serums*. These substances are obtained from the blood of animals inoculated with the germs of various ailments, the result being that their blood develops principles known as *antitoxins*, which can be used for treating similar diseases in man. Illustrations of the use of such remedies will be found duly detailed in the sections of this work dealing with such diseases as diphtheria and hydrophobia.

USEFUL RECIPES

1. BATHS.

Temperature and Uses of Baths.

Cold Bath, 32-60°.—Refreshing. Used to lower the temperature in fevers. A fever patient should in the first instance be placed in a *tepid bath*, the temperature of which can then be lowered by adding cold water or ice. Remain in bath 10-20 minutes.

Tepid Bath, 85°-95°.—Used for ordinary personal cleanliness. Sedative. Allays restlessness, and lowers the temperature.

Warm Bath, 95°-100°.—Induces perspiration. Allays nervous irritation. Useful in kidney disease, and in the convulsions of children.

Hot Bath, 100°-105°.—Same effects as the warm bath, but more powerful.

2. MEDICATED BATHS.

Take of—

Creolin (Jeyes') . . . 1 teaspoonful.
Glycerine . . . 1 teaspoonful.

Add to the warm bath.

Useful for Psoriasis.

Take of—

Carbonate of soda (washing
soda) . . . 4 ounces.
Dissolve in 30 gallons of warm water.

Useful in Chronic Eczema.

Take of—

Borax . . . 4 ounces.
Dissolve in 30 gallons of warm water.

Useful in allaying Itching.

3. POULTICES.**Starch Poultice.**

Take of—

Starch 2 ounces.

Make a paste with the starch and cold water, and then add a sufficient amount of boiling water to form a gelatinous mass. When cold spread on muslin and apply to the affected area. *Used for removing Crusts in Skin Diseases, and also as a sedative.*

Charcoal Poultice.

Take of—

Powdered charcoal . . . 1 ounce.

Linseed meal 2 ounces.

Mix the linseed meal and half the charcoal, and then add boiling water to make a soft paste. Spread on cotton cloth, and sprinkle the remainder of the charcoal on the surface of the poultice.

Used for cleansing Unhealthy Sores.

4. LINIMENTS.

Carron Oil.—Take equal parts of olive oil and lime water, and mix them together. Applied to the affected part on lint or soft clean rags.

Used for Burns.

A.B.C. Liniment.

Aconite liniment	} equal parts.
Belladonna liniment	
Chloroform liniment	

Useful for Neuralgic Pains and Rheumatism.
—To be rubbed into the painful area, which is afterwards to be covered with flannel.

Take of—

Tincture of aconite . . . 2 drams.

Oil of turpentine . . . 1 ounce.

Tincture of opium . . . 1 ounce.

Soap liniment 4 ounces.

Mix.

Used for Muscular Rheumatism.

Take of—

Compound camphor liniment 1 ounce.

Compound mustard liniment 1 ounce.

Oil of Scotch pine . . . 1 ounce.

Mix.

Used for Chronic Rheumatism.—The joint to be rubbed twice a day, and then packed in cotton wool. (Burney Yeo.)

Take of—

Menthol 2 drams.

Chloroform 4 drams.

Olive oil 10 drams.

Dissolve.

Useful for all forms of Neuralgia.

5. LOTIONS.

Take of—

Chloride of ammonium . . 1 ounce.

Rectified spirit of wine . . 2 ounces.

Spirit of ether 1 ounce.

Acetic acid 1½ ounces.

Distilled water . . . up to 12 ounces.

Dissolve and mix.

Evaporating Lotion.—Applied on lint or cloth to relieve the inflammatory pain of severe sprains. To be changed frequently. (Edinburgh Royal Infirmary Pharmacopeia.)

Take of—

Sulphurous acid 2 drams.

Glycerine of tannin . . . 2 drams.

Distilled water 4 drams.

Mix.

For Sore Nipples.—The nipples should be washed both before and after suckling, and the lotion applied on pieces of soft cotton cloth after each time the child is fed.

Take of—

Oxide of zinc 6 drams.

Talc }

Calamine } of each 1 ounce.

Glycerine }

Elder flower water up to 6 ounces.

Mix.

A soothing and astringent application for Eczema.—Shake the bottle and apply lotion with a camel hair brush, allowing it to dry on.

Take of—

Subchloride of mercury

(calomel). 3 grains.

Lime water 1 ounce.

Mix.

Black Wash. A stimulating wash for Ulcers.

Take of—

Borax 10 grains.

Sulphate of zinc 8 grains.

Glycerine 1 dram.

Distilled water 1 ounce.

For Running Ears.—Half a teaspoonful to be poured into the ear after syringing it.

Take of—

Corrosive sublimate . . . 5 grains.
Dilute acetic acid . . . 2 drams.
Rose water . . . 1 ounce.

Mix.

For Ringworm of the Scalp in Adults.—To be painted on the patch.

Take of—

Alum. 10 grains.
Distilled water . . . 1 ounce.

Dissolve.

Eye Wash.—Apply to the eye thrice daily, allowing a few drops to enter each time.

Useful for conjunctivitis.

Take of—

Boracic acid crystals . . 2 drams.
Distilled water . . . 1 pint.

Dissolve.

Eye Wash.—Useful for inflammation of the eye.

6. OINTMENTS.

Take of—

Subchloride of mercury
(calomel) 5 grains.
Spermaceti ointment . . ½ ounce.

Mix.

Used in Conjunctivitis.—A little to be applied to the edges of the eyelid at bedtime.

Take of—

Salicylic acid 10 grains.
Carbonate of zinc . . . 1 dram.
Vaseline 1 dram.
Spermaceti ointment . . 1 ounce.

Mix.

Useful for Eczema.—To be smeared over the affected areas night and morning.

Take of—

Precipitated sulphur . . 1 dram.
Glycerine ½ dram.
Benzoeated lard . . . 1 ounce.
Oil of roses 3 drops.

Mix.

Ointment for Scabies or Itch.—To be rubbed into the skin at bedtime, after a warm bath.

Take of—

Sublimed sulphur . . . 1 dram.
Balsam of Peru . . . ½ dram.
Lard 1 ounce.

Mix.

For Scabies.—To be rubbed into the skin.

Take of—

Gallic acid 20 grains.
Acetate of morphia . . . 5 grains.
White vaseline . . . 1 ounce.

Mix.

Useful for relieving the pain of Piles.—A little to be applied after washing and drying the parts.

Take of—

Sulphur ointment . . . 4 drams.
Nitrate of mercury ointment . . . 1 dram.

Mix together and then add—

Pure carbolic acid . . . ½ dram.

Mix.

For Ringworm.—To be well rubbed into the patch every night.

7. GARGLES AND INHALATIONS.

Take of—

Glycerine of borax . . . 1 ounce.
Chlorate of potash . . . 2 drams.
Tincture of catechu . . . 2 drams.
Rose water up to . . . 12 ounces.

For Tonsillitis.—Two tablespoonfuls to be used as a gargle frequently.

Take of—

Ammoniated tincture of
guaiaac 3 drams.
Compound tincture of
cinchona 6 drams.
Chlorate of potash . . . 2 drams.
Water up to 6 ounces.

For Tonsillitis.—A tablespoonful to be used as a gargle frequently.

Take of—

Borax 2 drams.
Boracic acid 2 drams.
Chlorate of potash . . . 1 dram.
Glycerine 4 ounces.
Hot water 1 pint.

Mix.

To be used as a gargle in Diphtheria.—In the case of children the throat may be washed out with a syringe.

Take of—

Creosote 3 drams.
Glycerine 3 drams.
Water up to 3 ounces.

Mix.

For Acute Laryngitis.—A teaspoonful to be added to a pint of boiling water, and the steam inhaled for five or ten minutes.

Take of—

Glycerine of carbolic acid . . 1 dram.
Bicarbonate of soda . . . 10 grains.
Hot water 1 ounce.

For Whooping-Cough.—To be used as a spray in a small *Siegle's* spray producer. The child to inhale the steam.

8. POWDERS.

Take of—

Powdered rhubarb . . . 2 grains.
Subnitrate of bismuth . . 10 grains.
Bicarbonate of potash . . 5 grains.
Compound cinnamon powder 2 grains.

Mix.

For Acute Indigestion.—A powder to be taken three times a day before meals.

Take of—

Compound kino powder . . 4 grains.
Aromatic chalk powder . . 16 grains.
Bicarbonate of soda . . . 8 grains.

Mix and divide into four powders.

For Diarrhœa in Children.—A powder to be given in a teaspoonful of water arrowroot every three or four hours. (Each powder contains $\frac{1}{20}$ th of a grain of opium in the kino powder.)

Take of—

Santonin 1 grain.
Compound scammony powder 2½ grains.
Calomel ½ grain.

Mix.

For Round Worms, in Children about one year old.—To be given at bedtime.

Take of—

Mercury and chalk (grey powder) ½ grain.
Rhubarb powder 1 grain.
Bicarbonate of soda . . . 2 grains.

Mix.

For Dyspepsia in Children.—One powder to be given night and morning for two or three days.

Take of—

Oxide of zinc 1½ drams.
Powdered camphor . . . ½ dram.
Powdered lycopodium . . 6 drams.

Mix.

The Dusting Powder.—For inflamed skin surfaces.

Take of—

Sulphate of sodium . . . 60 grains.
Bicarbonate of sodium . . 15 grains.
Chloride of sodium . . . 5 grains.

Artificial Carlsbad Salts.—A powder to be taken in a tumblerful of hot water before breakfast. Useful in chronic dyspepsia as an aperient.

9. PILLS.

Take of—

Thymol 1 grain.
Soap powder 2 grains.
Rectified spirits of wine a sufficiency to make a pill.

For Chronic Dyspepsia with flatulent distension.—A pill to be taken three times a day immediately after meals.

Take of—

Calomel ½ grain.
Extract of aloes 2 grains.
Extract of hyoscyamus . . 1 grain.

To make one pill.

For Constipation.—A pill to be taken at bedtime, and followed in the morning by a dose of artificial Carlsbad salts. (See Powders.)

Take of—

Extract of aloes 2 grains.
Powdered ipecacuanha . . 1 grain.
Extract of nux vomica . . ½ grain.
Powdered soap 1 grain.

To make one pill.

For Chronic Constipation.—A pill to be taken half-an-hour before dinner.

Take of—

Aloin 1 grain.
Euonymin 1 grain.
Extract of nux vomica . . ¼ grain.
Extract of hyoscyamus . . 1 grain.

To make one pill.

Purgative Pill.—One to be taken at bedtime.

Take of—

Phosphate of iron . . . 1 grain.
Phosphate of lime . . . 1 grain.
Extract of nux vomica . . ½ grain.
Extract of taraxacum . . 1 grain.

To make one pill.

Tonic Pill in Anæmia.—One pill to be taken three times a day after meals.

Take of—

Croton chloral hydrate . . 3 grains.
Glycerine of tragacanth, a sufficiency
to make one pill.

For Facial Neuralgia.—A pill to be taken every hour for three or four hours.

Take of—

Powdered digitalis . . . 1 grain.
Powdered squill . . . 1 grain.
Blue pill 1 grain.

To make one pill.

For Dropsy due to Heart Disease.—A pill to be given night and morning.

Take of—

Acetate of lead 2 grains.
Extract of opium ½ grain.

To make one pill.

For Chronic Diarrhœa.—A pill to be taken three times a day after food till 12 pills have been taken.

Take of—

Pure resorcin 1 grain.
Sugar of milk 2 grains.

To make one pill.

For Sea Sickness.—A pill to be taken every two hours.

Take of—

Sulphate of quinine . . . 2 grains.
Powdered digitalis . . . ½ grain.
Extract of opium . . . ¼ grain.

To make one pill.

For the Sweating in Phthisis.—A pill to be taken twice a day an hour before food.

Take of—

Creosote 1 drop.
Animal charcoal 2 grains.
Soap powder 2 grains.

To make one pill.

For Phthisis.—A pill to be taken three times a day shortly after food.

Take of—

Acetic extract of colchicum 1 grain.
Colocynth and hyoscyamus
pill 4 grains.

To make one pill.

For Gout.—A pill to be taken at bedtime when the bowels are costive.

10. MIXTURES.

Take of—

Ipecacuanha wine 1 dram.
Liquor of the acetate of
ammonia 4 drams.
Glycerine 2 drams.
Orange flower water up to 2 ounces.

Mix.

For Feverish Colds with Cough in Children.
—A small teaspoonful to be given in water every four hours.

Take of—

Ipecacuanha wine 1 dram.
Syrup of squills 4 drams.
Tincture of tolu 1 dram.
Water up to 2 ounces.

Mix.

For Bronchitis in Children.—A teaspoonful to be given in water every four hours.

Take of—

Ipecacuanha wine 1½ drams.
Spirit of nitrous ether . . 2 drams.
Solution of acetate of am-
monia 6 drams.
Orange flower water up to 2 ounces.

Mix.

For Bronchitis in Children.—A teaspoonful in water every four hours.

Take of—

Ipecacuanha wine 1½ drams.
Compound tincture of
camphor 1 dram.
Syrup of squills 6 drams.
Water up to 2 ounces.

Mix.

For Bronchitis in Children, when the cough is irritating.—A teaspoonful in water to be given every six hours. (One dram of compound tincture of camphor (paregoric) contains ¼ grain of opium.)

Take of—

Chloride of ammonium . . 90 grains.
Bicarbonate of sodium . . 60 grains.
Carbonate of ammonium . 30 grains.
Tincture of senega . . . 2 drams.
Chloroform water up to . 6 ounces.

Mix.

For Bronchitis in Adults.—A tablespoonful in water to be taken every six hours.

Take of—

Antimonial wine . . . 2 drams.
 Sweet spirit of nitre . . 4 drams.
 Solution of acetate of
 ammonia 1 ounce.
 Compound tincture of
 camphor 2 drams.
 Water up to 6 ounces.

For Acute Bronchial Catarrh.—When the cough is dry and painful. A tablespoonful in water to be given every four hours.

Take of—

Dilute hydrocyanic acid . 30 drops.
 Dilute nitric acid . . . 2 drams.
 Glycerine 1 ounce.
 Infusion of quassia up to . 6 ounces.
 Mix.

Begbie's Mixture.—Sedative cough mixture and tonic in phthisis. A tablespoonful in water to be given three times a day between meals.

Take of—

Bicarbonate of sodium . . 120 grains.
 Tincture of nux vomica . . 3 drams.
 Aromatic spirit of ammonia 4 drams.
 Spirits of chloroform . . 1 dram.
 Compound infusion of
 orange up to 6 ounces.
 Mix.

For Atonic Dyspepsia.—A tablespoonful in water three times a day half-an-hour before food.

Take of—

Salicylate of bismuth . . 60 grains.
 Extract of opium . . . 2 grains.
 Dilute hydrocyanic acid . 30 drops.
 Bicarbonate of sodium . . 120 grains.
 Mucilage of tragacanth . 1 ounce.
 Water up to 6 ounces.
 Mix.

For Acute Gastric Catarrh.—A tablespoonful in water to be taken every three or four hours.

Take of—

Carbonate of bismuth . . 60 grains.
 Carbonate of magnesium . 120 grains.
 Bicarbonate of soda . . . 60 grains.
 Glycerine 4 drams.
 Infusion of gentian up to . 6 ounces.
 Mix.

For Dyspepsia.—A tablespoonful in water three times a day before meals. Shake the bottle.

Take of—

Acid nitro-hydrochloric dilute 2 drams.
 Tincture of orange . . . 6 drams.
 Infusion of calumbæ up to . 6 ounces.
 Mix.

For Chronic Dyspepsia.—A tablespoonful in water to be taken three times a day after meals.

Take of—

Bicarbonate of sodium . . 120 grains.
 Aromatic spirit of ammonia 3 drams.
 Compound tincture of car-
 damoms 2 drams.
 Spirits of chloroform . . 1 dram.
 Peppermint water up to . 6 ounces.
 Mix.

For Flatulent Colic.—A tablespoonful to be taken every two or three hours.

Take of—

Tincture of rhubarb . . . $\frac{1}{2}$ dram.
 Spirits of chloroform . . . 12 drops.
 Aromatic spirit of ammonia 12 drops.
 Glycerine 2 drams.
 Caraway water up to . . 1 ounce.

For Colic in Infants.—A teaspoonful to be given every three or four hours.

Take of—

Acetate of lead 30 grains.
 Dilute acetic acid . . . 2 drams.
 Sedative solution of opium 30 drops.
 Infusion of cloves to . . 6 ounces.
 Mix.

For Bleeding from the Stomach.—A tablespoonful to be given every half-hour.

Take of—

Bismuth oxychloride . . 120 grains.
 Aromatic chalk powder . 120 grains.
 Bicarbonate of soda . . . 30 grains.
 Spirits of chloroform . . 2 drams.
 Mucilage of tragacanth . 1 ounce.
 Peppermint water up to . 8 ounces.

For Acute Diarrhœa.—An eighth part to be taken every two or three hours. A teaspoonful of the same mixture may be administered to children.

Take of—

Tincture of catechu . . . 1 ounce.
 Tincture of opium . . . 1 dram.
 Chalk mixture up to . . 3 ounces.
 Mix.

For Diarrhœa with pain.—A tablespoonful to be taken after each loose motion.

Take of—

Castor-oil	4 drams.
Compound tragacanth powder	1 dram.
Syrup	3 drams.
Caraway water up to	2 ounces.

Mix.

For Diarrhœa in Children.—From a teaspoonful to a dessert-spoonful, according to the age of the child, to be given every two hours.

Take of—

Solution of lactic acid (2 per cent.)	1 ounce.
Simple syrup	2 drams.
Water up to	2 ounces.

Mix.

For green Diarrhœa in Infants.—A dessert-spoonful after each suckling.

Take of—

Santonin	4 grains.
Castor-oil	4 drams.
Mucilage of acacia	4 drams.
Syrup of orange	2 drams.
Caraway water up to	2 ounces.

Mix.

For Round Worms in Children six or seven years of age.—Half to be taken in the early morning.

Take of—

Powdered kamala	1 dram.
Mucilage of acacia	4 drams.
Oil of male fern	1 dram.
Water up to	2 ounces.

Mix.

For Tape-Worms in Children.—Half to be given in the morning, the remaining half to be given three hours after the first dose. The child should have been fasting from the previous midday.

Take of—

Benzoic acid	2 drams.
Biborate of sodium	3 drams.
Water up to	12 ounces.

For Chronic Inflammation of the Bladder.—A tablespoonful in water to be taken frequently.

Take of—

Acetate of potassium	3 drams.
Sweet spirit of nitre	6 drams.
Infusion of digitalis	1½ ounces.
Water up to	6 ounces.

Mix.

For Dropsy due to Heart Disease.—A tablespoonful to be taken three times a day after food.

Take of—

Citrate of iron and quinine	80 grains.
Glycerine	4 drams.
Spirits of chloroform	2 drams.
Water up to	4 ounces.

Mix.

Iron Tonic for Anæmia.—A dessert-spoonful in water three times a day after food.

Take of—

Hydrate of chloral	30 grains.
Bromide of potassium	40 grains.
Syrup of orange flower up to	2 ounces.

Mix.

A Sleeping Draught.—Half to be taken at bedtime, and the remainder in three hours, if necessary.

Take of—

Paraldehyde	3 drams.
Syrup of lemons	2 drams.
Rectified spirit of wine	2 drams.
Water up to	3 ounces.

Mix.

For Sleeplessness.—A tablespoonful to be taken at bedtime, and repeated in an hour, if necessary.

Take of—

Bromide of ammonium	} 4 drams of each.
Bromide of sodium	
Bromide of potassium	
Distilled water	12 ounces.

Dissolve.

For Epilepsy.—A tablespoonful in a wine-glass of water or milk to be taken every morning.

Take of—

Chloral hydrate	20 grains.
Bromide of sodium	30 grains.
Spirits of chloroform	10 drops.
Water up to	2 ounces.

Mix.

Sedative for Children.—One or two teaspoonfuls to be given at bedtime.

Take of—

Salicylate of sodium . . . 2 drams.
Iodide of potassium . . . 1 dram.
Infusion of calumba to . . 6 ounces.

Dissolve.

For Rheumatic Pains.—A tablespoonful to be taken in water twice or three times a day.

Effervescing quinine mixture for Influenza.

Take of—

Sulphate of quinine . . . 20 grains.
Citric acid 80 grains.
Syrup of lemons 2 drams.
Water up to 6 ounces.

Mix.

Mixture No. 1. An eighth part to be taken with a like portion of mixture No. 2.

Take of—

Bicarbonate of potassium . 80 grains.
Carbonate of ammonium . 16 grains.
Water up to 8 ounces.

Mix.

Mixture No. 2. An eighth part to be added to mixture No. 1, and drunk during effervescence. Every four hours, or once every morning before breakfast during convalescence.

Take of—

Spirit of camphor. . . . 1½ drams.
Sweet spirit of nitre . . . 3 drams.
Ammoniated tincture of
quinine to 2 ounces.

Mix.

For Influenza.—A teaspoonful in water to be taken every four hours.

Take of—

Salicylate of sodium . . . 20 grains.
Dover's Powder 10 grains.
Sweet spirit of nitre . . . 1 dram.
Sol. of acetate of ammonia 4 drams.
Water to 2 ounces.

Mix.

For Lumbago.—Half to be taken at bedtime.

Take of—

Acid tartrate of potash . . 6 drams.
(Cream of tartar.)
Syrup of lemons 1½ ounces.
Water up to 12 ounces.

Mix.

Imperial Drink.—(Edinburgh Infirmary.) A tablespoonful in water to be used as a cooling drink in fevers.

SECTION IX

HOME NURSING

The Nurse.—Knowledge.—In these days when a family cannot afford the fee of a trained nurse, it behoves us to have in every household a “home nurse”—some one to turn to when the measles or the influenza come along, or when the baby is sick or granny is ailing. It is absurd to have to engage a highly-trained woman for every little illness, and shows a sad decrease in general capability since the days of our grandmothers. But if we no longer have a still-room, and a knowledge of herbs and possets, we have other advantages. Every girl nowadays can get teaching in first-aid, hygiene, and home-nursing if she takes a little trouble. There are all sorts of societies, such as the St. Andrew's or St. John's, which will organise classes in these subjects, supposing they have not been included in the school course, if only a sufficient number can be

found to attend. And there never yet was a woman who, at some time of her life, did not desire a knowledge of nursing. As a rule, the nursing fever is taken young, and the girl in her teens decides to follow in the footsteps of Florence Nightingale. This enthusiasm should not be checked or snubbed—it should be turned to practical advantage, and the girl should be encouraged to learn elementary physiology and hygiene, and to attend any nursing lectures within reach. Then get a good book on home-nursing and let the girl study it, and have it at hand for reference purposes: the time for putting such knowledge to use is sure to come.

But neither theory nor practice is sufficient to make a good nurse. Do we not all know the vigorous young woman who rushes eagerly forward to the accident case, elbows aside the friends, produces a bandage and proceeds to apply it elegantly but roughly, and then orders the patient off to the hospital? Or the nice kindly lady who swoops down on the rheumatic cottager, flings open all the windows, orders him exercise, insists on rubbing his swollen joints, and tells him cheerfully that rheumatism is the result of drink? Every one who has been ill knows that, in spite of what the hospitals say, there is a great deal in the old desire for the “born nurse”—the woman to whom nursing is a natural vocation, whose sympathies are at once aroused by suffering, who is gentle and thoughtful and unselfish.

Character.—If it is generally possible to secure a certain amount of technical training in the theory and practice of nursing, it is always possible to train one's self in the mental and moral qualities which go to make a good nurse; such, for instance, as patience and perception. For the good nurse must never be disheartened, must never be vexed, must never utter the hasty word or give way to sullen moods; and patients can be very trying sometimes. So, day in and day out, the would-be nurse can watch her tongue and her temper and practice silence and smiles. If you cannot be patient and forbearing with those who are well and strong, most certainly you will fail with those who are ill and irritable. Then powers of perception can be trained whilst dusting the parlour, whilst playing the piano, whilst walking along the street, or, best of all, whilst taking lessons in drawing. A self-absorbed person never notices the thimble on the shelf but dusts it down behind the curtain; never notices the *presto* in the accompaniment and plays it all at the same pace; never notices that fish is cheap to-day when out walking in town, or that the trees are budding when out in the country. In fact there are hundreds of persons who never notice anything which does not concern themselves, whose eyes are ever turned within.

This is the root of that want of observation which is fatal in nursing. Miss Lückes, matron of the London Hospital, says, "Truthfulness, obedience, and punctuality are simply indispensable qualities." Miss Florence Nightingale says, "Sound and ready observation are essential in a nurse;" and again, "Every nurse should be one to be depended on; she must be no gossip, no vain talker; she must be strictly sober and honest. But more than this, she must be a religious and devoted woman; and she must be a woman of delicate and decent feeling." Miss K. P. Hicks demands, "Tact, loyalty, experience, and kindly sympathy." Miss Esther Young says, "Be tactful, be kind, be humble, be patient, be strictly obedient to the doctor under whom you work." But, indeed, there is no limit to the virtues that are needed in this calling, so that it is on record that a doctor once demanded that a nurse should be "a hospital-trained angel, with a cast-iron back!"

Dress.—And then a nurse must be outwardly as well as inwardly fitted for the service of the sick-room; she must be clothed quietly and hygienically, with no rustling petticoats, or trailing skirts, or creaking stays; no jingling bracelets, or flopping sleeves, or squeaking shoes. And she must know how to move about without knocking things over, and yet without hesitation. "In quietness and confidence shall be your strength" is more true in the sick-room even than elsewhere. It is not mere chance which has given a distinctive garb to nurses—the fashion would have passed long ere this if it had been; and though we do not require that the home nurse should wear uniform, we do ask her to dress suitably with nice, clean, washable frock or apron, so that her very appearance shall be refreshing and health-giving. To wake up in the morning and see a tired woman in sloppy dressing-gown, and with tumbled hair, preparing one's breakfast is to lose one's appetite and to start the day wrong. In attendance on the sick always be neatly, quietly, and hygienically clothed.

And then there is the question of personal cleanliness—a not unnecessary one when lack of it may mean the spreading of disease, and danger to others as well as oneself. After a night in a sick-room a cold bath is a useful stimulant often resorted to by a nurse, but it is not cleanliness from a surgical or medical point of view. Miss Nightingale in her "Notes on Nursing" says: "What I mean is, that by simply washing or sponging with water you do not really clean the skin. Take a rough towel, dip one corner in very hot water—if a little spirit be added to it it will be more effectual—and then rub as if you were rubbing the towel into your skin with the fingers. The black flakes which will come off will convince you that you were not

clean before, and you can really keep yourself cleaner with a tumbler of hot water, a rough towel and rubbing, than with a whole apparatus of bath and soap and sponge without rubbing."

Most people resent directions as to personal cleanliness, and yet few people maintain the standard of cleanliness necessary for good health. We are most of us far too careless about a sufficiency of clean linen, clean dresses, clean jackets; we are all apt to neglect the washing of the hair and other details. At one hospital directly after prayers the nurses stand up in a row and hold out their hands in front of them, and the matron walks along and inspects minutely the cleanliness of fingers and nails. The home nurse may not have to undergo this daily "nail parade," but it should be her pride to ever be fitted to undergo it, and to be strict with herself in the matter of cleanliness—to be in fact her own superior.

There is often a tendency when tired to get slack about these details. Watch against this tendency and aim at personal perfection.

The Sick-Room.—Cleanliness.—It is not always possible in home nursing to get a choice of rooms, but when it is choose one that is airy, light, quiet, and convenient as regards the sanitary arrangements and the kitchen. Unless the case is infectious there is no need to strip the room and make it bare and ugly and noisy; it is the over-officious and thoughtless nurse who takes up the carpet and goes stumping about on the bare boards when there is no necessity. Slip useless rugs and over-numerous ornaments quietly away, for the main aim is to keep the room clean without too much work to yourself or disturbance to the patient. But remember that an ugly dull room will retard recovery; and introduce fresh flowers, and, if possible, some fresh colouring into the room constantly. Remember to consult your patient's tastes—without asking him, but by observing him: you may like Botticelli photographs and he may like sporting prints; or if your patient is a child, he may like toys about, and then you mustn't clear "all the litter" away with your most superior manner. In all things consider the patient; in all things try and sink yourself. Even if you are lucky enough to start with your room clean, and clear from useless articles, it is very difficult in cases of extreme illness to keep it clean; and in these cases it is work for the nurse, not for a servant. The carpet or floor should be rubbed over with a damp cloth, as the dust raised by sweeping may do much damage, especially in lung, or surgical, or maternity cases: if you must sweep try and get a patent carpet-sweeper which holds the dust. The dusting should be done as far as possible with a damp duster, but do not leave polished furniture all smeary—take a clean dry cloth over it afterwards. Have an ashpan under the fire to catch the ashes, and

then it can simply be carried away in the morning to be emptied and cleaned. If the fireplace hasn't one it is generally possible for a woman with a little ingenuity to construct one out of an old box or tray : some fine earth or sand sprinkled over the bottom will prevent the noise of falling cinders. The fire-irons should be taken away, and a piece of wood used as a poker, and an old glove kept for putting on coal. To keep up a fire noiselessly needs little but frequent attention ; a few ashes removed from the bottom with the stick, a few small knobs put on the top every hour, will keep up a regular degree of warmth without noise, and without great bursts of flickering fire-light which so often disturb a patient at night. The grate can be lightly swept with a soft brush every morning, and touched up with one of the patent blackings, put on with a cloth or sponge, which needs no polishing. In this way you may get rid of the half-hour of agony often imposed on a patient when a servant comes in to "do the grate," and scrapes up the ashes, thumps her brush against the corners of the grate, and rattles the fire-irons.

Warmth.—Unless the doctor orders otherwise, aim at keeping your room at from 60 to 62 degrees Fahr., and have the thermometer hanging above the patient's head. A coal fire is the most healthy means of warming a room, but hot air, steam, hot water, and electricity are much less trouble. Where, as in an hotel, you find one of these methods provided, the question of warmth means merely careful attention to the regulator. Sometimes when a room has a fireplace and yet is warmed by hot water pipes, it is worth while to keep a small lamp burning in the grate in order to make the chimney serve as an outlet for bad air ; this is also sometimes done in summer when a room gets stuffy. But oil stoves and gas stoves should be avoided as far as possible ; an oil stove uses up as much air as two men, a gas stove uses up as much air as four men, and a lamp uses up as much air as one man. If you have to use gas or oil stoves try and keep a kettle boiling so that some of the steam comes into the room, for those stoves dry up the air excessively and make it irritating—specially in lung cases.

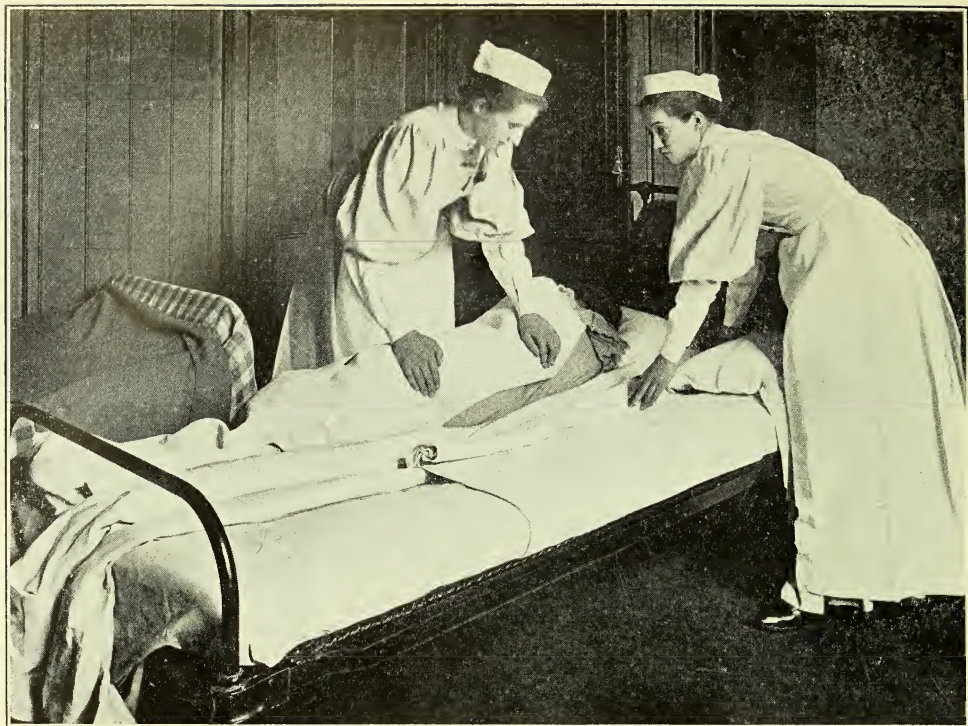
Ventilation.—Somehow or other you have got to get fresh air into the sick-room, and foul air out. The proper inlet is the window, and the proper outlet the chimney, but, alas ! architects never seem to consider the question of draughts, and it is rare indeed to find door and fireplace and window so placed that you can put the bed where the patient can be kept comfortably warm and supplied with fresh air, without special arrangements. As a rule the window should be kept open at the top day and night ; the old-fashioned horror of "night-air" is departing now, and we know that, in towns at least, the air is

often purer at night than during the day. There is a contrivance known as the Hinckes-Bird ventilator (see vol. iii. p. 223), consisting of a narrow board which you shut the lower sash down upon, and so leave a space between the two sashes in the middle of the window where the air can enter, and can be given an upward tendency in entering. With trellis windows opening outwards it is also possible to insert a slip of wood between the two, both being slightly open, and air comes in then only above and below through narrow spaces. These contrivances must always rest on the ingenuity of the nurse. Personally I have found it easier as a rule to ventilate through comparatively large apertures; it is the draught through the keyhole that cuts most. Even having arranged for a constant trickle of fresh air to get in without blowing across the patient, the foul air is apt to clog in the corners of the room. There is an old theory that you should not ventilate by the door, as you are probably getting in the foul air of the rest of the house; but if outside the door you can arrange for a cross current of fresh air, then throw your door wide and put a screen across inside between the door and the patient, you will be able to get a thorough change of air without draught. Just remember the main principle that each person requires 3000 cubic feet of fresh air per hour: with a room 14 ft. long, 12 ft. wide, and 12 ft. high, and occupied by nurse and patient, the air would need changing three times an hour—by no means an easy thing to do without appliances, especially if the room is cumbered by large furniture. Remember that any dirt in the room will help to foul the air; the effluvia from an ill-kept bed, the presence of slops in the room, the damp soiled towel in the rack—all these are bad. A cultivated sense of smell soon betrays where the evil lies, and the nurse should try and cultivate the sense of smell. Never cover up a disagreeable odour by the use of scents or disinfectants; it is always suspicious to go into a room where it has been necessary to burn a pastille or use a scent spray. The proper way to get rid of foul smells is to remove the cause and let in fresh air: then as a luxury the patient may be allowed scents if he likes them—but they do not come amongst nursing requisites. I never saw a scent spray in a hospital ward; I have scarcely ever seen a private sick-room without one.

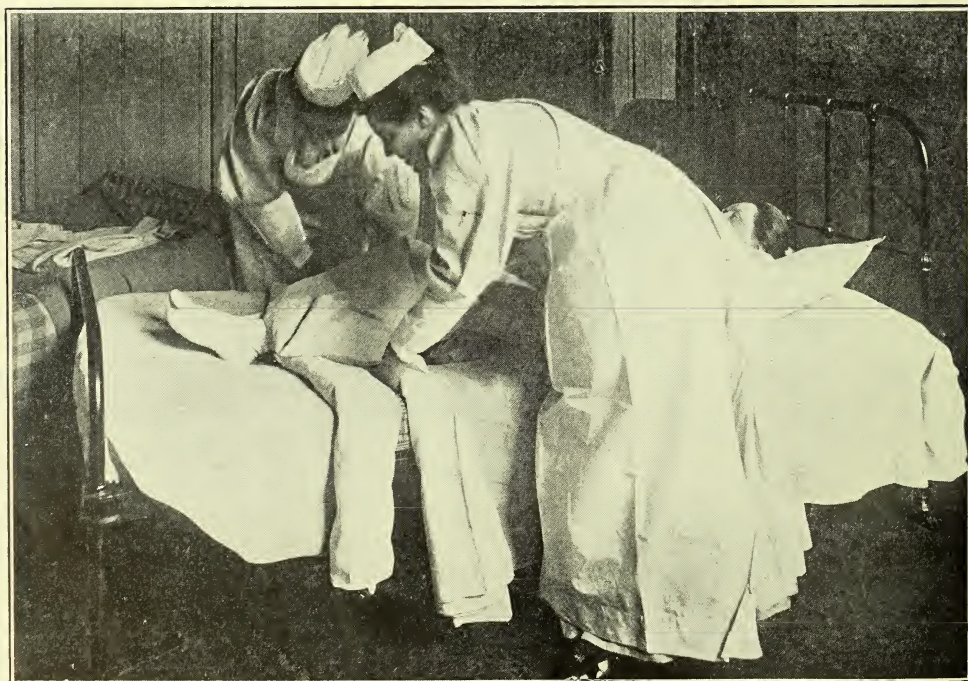
Light.—Since the discoveries of Dr. Finsen we have come to appreciate more the healing powers of light, and yet in many a house the blinds are still let down to keep out the sunlight because of the carpet. The housewife is always apt to care more for her house than for her living family. Flowers fade and droop in a dark room, so do children in a dark house. And then darkness always means dirt; and germs grow in the dark, whereas sunlight at once kills them.



HOME NURSING

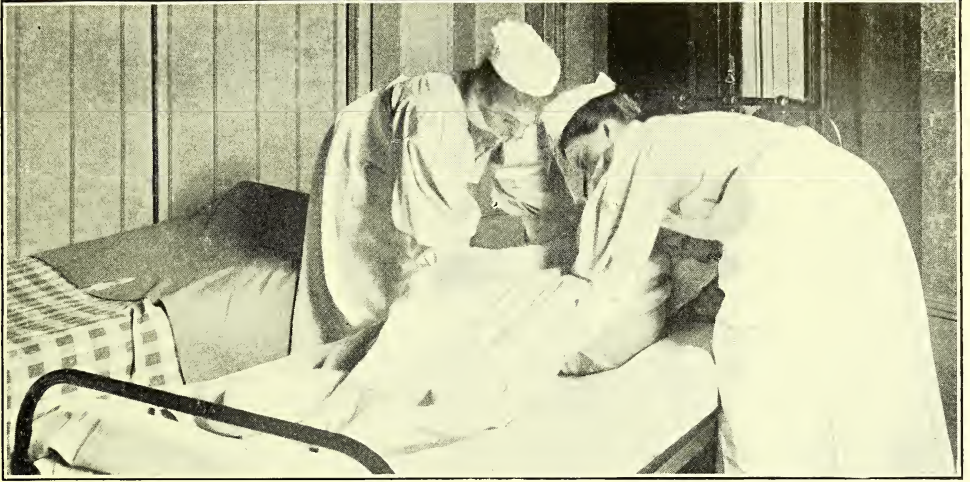


CHANGING SHEETS.



CHANGING SHEETS.

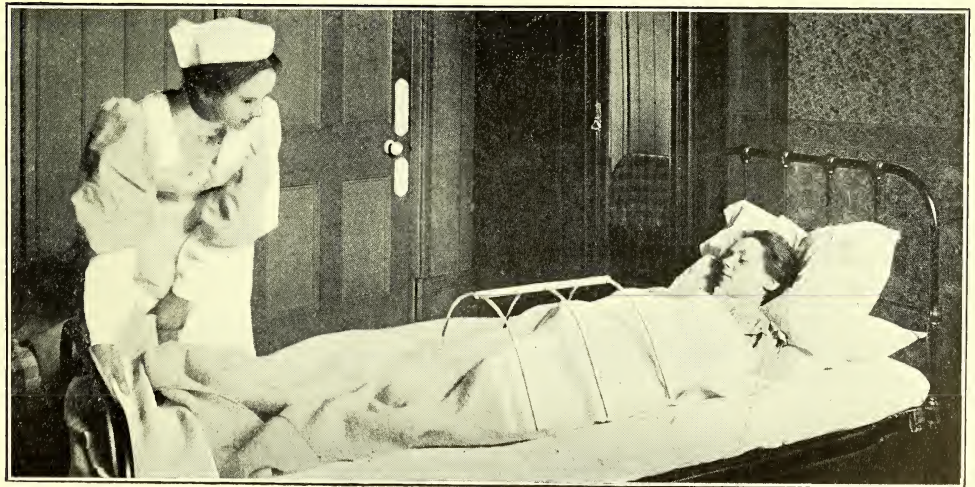
HOME NURSING



LIFTING THE PATIENT.



THE BED SLING.



THE BED CRADLE



There is no greater purifier than sunlight, and we have little enough of it in our country : let us take all the advantage of it we can. Depression and evil thoughts are also caused by darkness, so especially during convalescence you need light for your patient, but at all times you need it in order to be able to see into all corners and see that they are clean. But though the life-giving powers of light must never be forgotten, care must be taken of the patient's eyes, and blinds drawn or screen placed if he seems to feel the glare. And remember you must not wait for your patient to tell you the light hurts him : you are there to spare him not only all physical exertion, but all mental exertion. If your powers of observation are properly trained, your sympathy properly developed, you will easily see whether the light is too great to be pleasant. There are many illnesses in which glare in the eyes is distinctly harmful, but if the patient has heard you proclaiming the hygienic value of sunlight he may not like to complain. In the same way the flame of the fire often hurts tired eyes, and should be screened from the bed. A screen is always handy in a sick-room, and can easily be made by joining some soft-coloured cotton (without a pattern on it) over a clothes-horse.

The Bed.—The bed should stand away from the wall so that the nurse can get at both sides easily ; it should be placed out of draughts so far as possible, and should not be too large or high. Mrs. Strong, matron of Glasgow Royal Infirmary, says : “ A plain bedstead, without hangings of any kind, and not too wide, and fitted with a spring mattress and a very thin hair mattress placed upon it, is ideal—excepting for fractures, when you must get the firmest possible frame and mattress.” The home nurse seldom has ideal appliances ; it is her glory to do good work and never grumble at her tools, and severe cases have been nursed on flock beds and never got bed-sores, and dear old grannies have been left on the feather beds they loved, and been none the worse. But it is more trouble to keep such beds sweet and smooth ; remember the time and trouble our grandmothers took over bed-making—how they aired and turned and pummelled their feather beds. You can't do that in a sick-room.

Bedding.—The bedding will depend upon the case, upon the time of year, and upon the patient's fancy ; but let it be *light*. Miss Nightingale declares that in nine cases out of ten feverishness is a symptom of bedding and not of fever. In rheumatism and certain cases you will be ordered to do away with cotton sheets altogether, and replace them with woollen ones or blankets. The Jaeger sheets are most comfortable in these cases, for blankets are apt to tickle the patient's neck, hands, &c., and irritate him. And in these cases the blankets which are used as sheets must be changed as often as sheets ;

the stuffy odour of bedrooms is generally due to the amount of organic matter given off by the skin and held in the bed-clothes. Blankets are seldom washed often enough, and when any one is actually living in bed day and night, the supply of clean bedding must be as ample as possible. An under-blanket is apt to act as a poultice, and in long cases to help produce bed-sores. A heavy cotton quilt should never be used. Never place slops under the bed—this dirty habit allows the effluvia to go straight into the mattress, and then you wonder that the bed smells unpleasant. Extra pillows will be needed, and often, especially in hot weather, a rather hard pillow, that the head will not sink too far into, will be found cooling and refreshing. A little square cushion to put in the hollow of the back, a little “roly-poly” cushion for the neck, are articles I have seen a thoughtful nurse supply, to the great comfort of the patient. A good stiff bolster under the knees will keep the patient from slipping down in bed ; but the main advantage of extra pillows is to be able to slip in fresh ones now and again, that have been thoroughly beaten and aired outside the room.

Water Beds.—In cases in which a water or air bed is used, the bedstead should be covered by boards, over the boards an old blanket should be placed, and the water bed on the top of that. It must be filled with water at from 80 to 90 degrees, and while in use should keep at the temperature of 70 degrees without further additions; but the nurse must occasionally feel the bed, and if it shows a tendency to get chilly, let out a pail of water and replace it with a pail of hot water. The filling and emptying of a water bed is tedious work ; and once the bed is full it is so heavy the bedstead cannot be moved. Air beds are much lighter and more convenient, but some doctors do not approve them. Small air or water pillows are also useful in some cases. All these rubber goods are expensive, and very apt to perish ; do not put away a water bed to keep for any lengthy time—it is almost sure to spoil, and it is wiser to give it where it is needed, or sell it. Some chemists lend air and water beds and pillows.

Bed-Making.—It is impossible to put too great stress on the art of bed-making in cases of sickness : only those who have had to live in their bed for months or weeks know how the weariness and pain can be decreased by skilful hands and thoughtful mind. And the hospital ward, with its straight counterpanes and carefully laid-out patients, must be no model for the home nurse ; nothing is more unkind than the way in which the ordinary hospital nurse considers the appearance of her ward before the comfort of her patients. The home nurse will learn that her patient likes to crawl to the edge of the bed and hang half-over, especially if there is a little bedside table on which an arm can rest. And sometimes to lie on the face with a

pillow under the body is a great comfort, especially if there is flatulence. So, however neatly you make your bed, do not expect your patient to keep it neat; he is probably in a dangerous state of weakness if he does. If possible, get your patient once a day on to a couch or another bed, whilst you make his. It is very wonderful how skilled nurses can make a bed whilst the patient is in it; but under these circumstances the bed cannot be thoroughly aired, and the patient must be pulled about. Often it would be far less fatiguing both for patient and nurse to lift the patient on to a couch, or to wheel up a bed or table and draw him by means of the sheet on to that, whilst his usual bed is made. If a macintosh is needed, it is put on over the lower sheet, pinned to the bed with four safety pins, and then another sheet folded lengthwise is put over the macintosh; leave as much of the sheet to one side of the bed as possible, so that there will be a fresh piece to pull through under the patient when the first half gets damp or crumpled. This is called a "draw sheet," for it is very important to keep it smooth and constantly tightened, or it may help the formation of bed-sores. Ordinary sheets should be aired at the fire whilst the mattress is being turned. Air the dirty sheets if they are going on again; they are probably damp from the patient's skin, and you do not want him to get a sensation of chill when you put him back to bed again.

If your patient cannot be got out of bed and is quite helpless, get some one to come and help you with the bed-making, and get all you need in the way of clean sheets and so on in the room before you begin. Ascertain that the patient is in no draught—if necessary shut the window for a few minutes; then you go to one side of the bed and send your assistant to the other. Remove all extra pillows and coverlets. Untuck all the bedding; draw the remaining pillows toward your side of the bed, put your hands (see that they are warm) under the clothes and draw the patient's feet towards you; then take firm hold of the sheet with both hands, on a level with the patient's shoulders and buttocks, and draw the patient on the sheet to your side of the bed—the assistant on the other side can push very gently and steadily. Now lean over the patient and put one hand under his shoulders, the other under his buttocks, your hands being outside the top sheet and blanket, and rather tucking them under him, and so help to roll the patient on to his side, right on your edge of the bed. You must stand close to the bed, and stand firmly, or the patient may feel he is falling out. There is now three-quarters of the bed free for your assistant to work on. She pushes the upper sheet and blanket well into the patient's back, she rolls the draw-sheet (if there is one) up in a roll towards his back, and she rapidly sponges over

the macintosh with a little warm water in which a little sanitas or formalin has been put. She dries the macintosh, rolls it up towards the patient's back, rolls the under-sheet up towards the patient's back, shakes up or beats gently the half of the mattress she now has free. The clean under-sheet should be ready rolled lengthways with a short free side; this roll is placed close to the sheet that is coming off, and the free side is tucked in over the half of the bed next the assistant. The macintosh is unrolled over the clean sheet; a clean draw-sheet is put over the macintosh with the end towards you rolled up and pressed against the patient's back. The extra pillows are put back on the clean side of the bed; then you gently let your patient down on his back again on the top of the rolls of sheets; your assistant leans over and puts her hands under the patient's shoulders and thighs on your side, and with your aid rolls him over towards her on the clean side of the bed. Whilst she supports him you rapidly withdraw pillows and dirty sheets, wipe your side of macintosh, shake or beat your side of the mattress, unroll the clean sheets and tuck them in, then your patient can be allowed to lie on his back again; the under part of the bed is made. This process should not take more than five minutes; the whole art consists of making first one side of the bed and then the other, getting the patient well to the opposite side to that which is being made (see Plate). The upper sheets, &c., can be easily changed and then the patient will probably want lifting up in bed, and when there are two persons and the bed is narrow this is easily done by standing one on each side and clasping hands under the patient's shoulders and under his buttocks, his knees being flexed, and lifting together. If you are alone get well behind the patient—kneel on the head of the bed if necessary—put your arms under his shoulders and arms, and clasp them over his chest, and lift the patient up and back.

In certain cases of heart disease and fractured limbs the patient cannot be rolled on his side; and then you must back your bed from the bottom up, as shown in the illustration, and the sheet must be rolled from the feet up to the buttocks, and the clean sheet put in and rolled up after it. Then raise the patient slightly by one hand in the small of his back and roll up the dirty and unroll the clean sheet up to his shoulders. Raise his shoulders slightly and take away the dirty sheet altogether and finish unrolling the clean one (see Plate). Of course in cases of heart disease you never take away the pillows whilst making the bed.

The tendency to slip down in bed is one of the most distressing signs of weakness. If the bolster under the knees is not enough, a footstool to the feet will help; a pillow there makes the feet too hot

as a rule. Two Jack towels slip-knotted together, the knot just between the legs under the thighs, and the ends of the towels just over a broomstick behind the top of the bed, is a London Hospital trick for preventing patients from slipping, and is shown in the illustration (see Plate). In some illnesses—acute rheumatism for instance—the weight of the clothes cannot be borne, and then some half-hoops are arranged as a sort of cage over the limbs, in a form called a “cradle” (see Plate). Indeed, an old cradle turned upside down and the top and bottom knocked out makes a good substitute; or a child’s hoop cut in two and laths tacked across; or stout strings tied from the foot of the bed to the sides near the top; or two pieces of board tied to the sides of the bed. There are endless ways in which a thoughtful woman can contrive to ease the weight of blankets, but in a town it is generally worth while to buy a proper bed cradle; they are not dear. Don’t get “wearied in well-doing” if your patient, in spite of all your efforts, grumbles about his bed. Try and meet all his requests, and remember it is his home for the time being; and also note that if he can grumble he is probably getting better. In serious cases *you* have to discover whether the bed is comfortable or not.

Bed-Pans.—Where the patient is well enough to get out of bed and use a commode put close to the bedside, he is sure to prefer to do so; but in helpless cases a bed-pan should be slipped under the patient by the left hand, whilst the nurse’s right hand lifts the patient’s back, being placed flat in the small of the back. As a rule the pan should have a flannel cover to slip over it before use to avoid chill; if this is not done put a little hot water in the pan to warm it. Always have a cover to put on the pan immediately it is withdrawn, and take it away and empty and wash it yourself. In an emergency a shallow enamelled iron pie-dish can be used; it is more easily slipped up from below than in at the side. Don’t use a china one, it may break and cut the patient. Urine bottles for male patients can be bought at any chemist’s, but in an emergency a tin can or a vase can generally be found that will do for a time. The utmost cleanliness of vessels and courtesy to the patient are necessary in order to perform these services without adding to his distress.

The Daily Round.—One of the great advantages of hospital training is that it teaches a woman to be methodical and punctual; one of the great disadvantages of the home nurse is that she is always pottering about, never quite sure what to do next, unpunctual and apt to forget. In the middle of dusting she says, “Oh dear! I’ve forgotten the medicine!” and goes to get it; or just when the patient is going off to sleep and thinks everything is quiet for the night, she

remembers she hadn't taken his temperature, and rouses him and turns up the light that she may do so. You must train yourself in orderliness, punctuality, and method; if necessary, map out the daily round on paper at first, and watch yourself very carefully till you obtain methodical ways. There is a great sense of peace and rest in having a time for everything and everything in time; and the whole aim of nursing is to secure this state of rest for the patient. It is the doctor's work to cure—to use drastic drugs or the knife if necessary—you have only got to help nature by keeping the patient at peace and in as hygienic surroundings as is possible.

Let us begin an imaginary round of twenty-four hours at 8 P.M. The patient has had his supper, and the nurse goes away for hers, leaving a friend in charge. At 8.45 she returns, having had her food and a wash and a chat with one of the family, or else a few brisk turns out of doors. She glances at the thermometer—what with the lamp and blinds down the room is apt to get hot in the evening—and dismisses the friend. If there is medicine to give she gives it. She sponges the patient's hands and face, tightens the under-sheet, puts fresh pillows, takes the flowers out of the room and brings in all she needs for the night. Note, *all* she needs; food can be left just outside the door, but otherwise let her be sure she has what is wanted in the room. Plenty of coal, for instance, done up in paper bags if it is small, so that a bag can be lifted on quietly. And let the nurse have a kettle at hand—she will probably be the better of a cup of tea for herself about 4 A.M., and about the time when the temperature is apt to fall the patient may need a hot-water bottle to his feet. The plan of giving a patient a hot-water bottle at 9 P.M., when in all probability he is warm and the room is hot, and leaving the bottle to cool through the small hours, is an absurd illustration of how little some nurses can get outside themselves, and put themselves in the patient's place. Because, as a rule, you find a hot bottle comforting when, after working or sitting in a hot room, you go into a cold bed in a cold room, and then sleep through the night, you provide this same "comfort" for a patient who is under quite other conditions. Real sympathy here is lacking.

All being ready in the sick-room, the patient comfortable in bed and shaded from the firelight, and the fire well made up, the nurse should put her chair or couch in the most convenient position where the patient can see her, but where she is not looking directly at the patient. Except in very serious cases it is a mistake to watch the patient continuously; but equally it is a mistake to sit behind a screen when the patient cannot be sure of your presence. Never stay awake all night unless it is absolutely necessary: you can soon form

the habit of rousing up every hour or so to see that the fire is all right, and to attend to any nursing duties. Don't make yourself too comfortable if you wish to do this; and place your watch in front of you and note the time. Suppose it is eleven, then say to yourself, "Now, I can doze till twelve," and settle down. If it is a serious case and the nurse must keep continuous watch, it is well to have a book or some needlework on hand, and never doze at all. About two it will be necessary to keep a sharp watch on the temperature of the room, and see whether the patient needs an extra blanket or a hot bottle; from then on till five or six is the most trying time of the nursing round. The patient is apt to be weak and wakeful, the nurse to be tired and anxious: it needs a good deal of courage sometimes to get through these early hours without rousing the household. A glass of hot milk, or bathing the feet in hot water and putting on night socks, may help to induce sleep. The nurse must remember not only to feed her patient but to feed herself—if she is on duty all night she will need some beef-tea and toast, or some tea and bread and butter, just as much as during the daytime. It is seldom indeed that the patient won't desire to share the early cup of tea, and unless there are orders to the contrary, allow it. As soon as the household is awake and some one can take your place slip away for a wash and a breath of fresh air, and then set about getting your patient's breakfast. While he is resting after food, get your own breakfast. Then, having attended to any nursing duties, such as charting the temperature, giving medicine, and so on, proceed to get the room cleaned. Then do your patient's toilet. When a woman is very ill the most comfortable way of doing the hair is in two plaits—one hanging down in front over each shoulder; then the hair can be brushed and dressed by merely turning the head first to one side then to the other. Wash your patient all over—one of the things which has most won fame for trained nurses is that they are not afraid to wash their patients. After the face, hands and arms, and feet and ankles, have been thoroughly washed with soap, get some fresh, very hot water, and wring a sponge out in it quickly, and pass it under the clothes and over the patient's body, doing a bit at a time, and drying each bit with a warm soft towel immediately after the sponge has passed. Nothing gives a patient a greater sense of refreshment and comfort than to be *clean*, nothing is so uncomfortable as to lie in a damp, unpleasant perspiration. Some nurses keep a special blanket for washing time, and slip off the top bedclothes and have only the washing blanket over the patient while they are sponging. Then if it gets the least damp this blanket can be taken away to be dried. Next put the patient into a clean shirt, or the one he wore the day

before, and which has been aired; always choose a large shirt, and, if necessary, cut it up the back and put it on like a pinafore. Do not let him wear the same shirt day and night unless the case is so severe that the doctor forbids all movement. You unbutton the shirt and draw it up under the armpits in front; and at the back you draw it up right under the neck. You raise the patient's head, take hold of the roll under the neck behind, and raise and lift and slip it forward over the head; the old shirt is now hung on the chest free. Get the clean one from in front of the fire, slip off the old one, hold the clean one with the back rolled up and the neck wide open. Slip the arms in first, then raise the head and slip the roll over the head; put your hands under the shoulders and draw it down—draw it down in front also, and be sure it is *quite smooth* under the back. Now you can get to your bed-making, and if the case is a long one, when you turn the patient on his side for the changing of the sheet, it is well to rub some spirit—methylated spirit is the cheapest, eau-de-Cologne the nicest—on the back of the thighs, and then powder well with starch. This is one precaution against bed-sores. By the time your bed-making is done your patient will need some refreshment. You also will want to slip away and make yourself tidy for the doctor, whose call in serious cases is generally in the morning. Always have ready for the doctor a hand-basin, some hot water, and a clean towel; also a tumbler of tepid water for him to wash his clinical thermometer in, and he will probably like a few drops of some disinfectant added to the water. You will also have a written report with regard to the patient, which as a rule should record the temperature, evening and morning; the amount of nourishment taken; the medicine taken; whether the bowels have acted or not; the amount of sleep, and any remarks on important points. If you have no chart for recording all this, the following is a convenient form:—

Temperature.—E., 102.2; M., 99.8.

Medicine.—8 P.M., 8 A.M., 12 noon, 4 P.M.

Nourishment.—Beef tea, 10 ozs.; milk, 1½ pints; beef essence, 2 teaspoons; 1 cup of tea, 2 rusks; brandy, 2 ozs.

Sleep.—7 hours; dozed during day.

Bowels.—Once, slightly.

Remarks.—Patient had a quiet night.

Such a report handed to the doctor shows him at a glance how the patient has sped, and spares unnecessary talk. Always stand on the opposite side of the bed to the doctor, and be ready to unbutton the night-shirt or help him in any way. Follow the doctor from the room in case he has any orders he wishes to give you, but does not wish the patient to hear. In the middle of the day the nurse must

get her own sleep—no amount of dozing in the patient's room makes up for a few hours in bed, properly undressed : also a certain amount of time *must* be spent in the open air. Leave careful directions as to the patient's needs, and as to visitors, &c., while off duty ; if you "organise" well, there is no need to be "on duty" yourself the whole time. It is not good nursing for the nurse to grow tired out, fussy, and over-anxious : remember the patient draws his strength from you, so you must be strong.

What to Observe.—The patient ought not to need to tell you anything—you are there to save him not only physical exertion, but also mental exertion, and to preserve perfect rest for him. Some of the signs you need to read his condition from are :—temperature, pulse, breathing, posture, appetite, evacuations, perspiration, colour of face, flushings, rashes, pain, effect of medicines, and so on.

Temperature.—First, as to temperature. The normal temperature of the human body is 98.4 degrees F. ; over 100 degrees is



FIG. 30.—Clinical Thermometer.

The black mass represents the indicator, and the arrow the normal temperature.

feverish ; a temperature of 103 or 104 degrees is serious. Any temperature under 97 degrees probably denotes collapse. As a rule, in sick nursing the temperature is recorded at eight in the morning and at eight in the evening by means of a clinical thermometer. This little instrument can be bought for five shillings from any chemist, and the home nurse should familiarise herself with it in times of health. There is a bulb of mercury at one end, and mercury is a metal which expands enormously with heat. From the bulb a little hollow tube runs up the glass stem, and the glass stem is graduated (as a rule) from 95 degrees to 110 degrees, a little arrow pointing to the normal point at 98.4. In the hollow tube is a little bit of wire, or "indicator." If you put the bulb of the thermometer into slightly warm water you will see the mercury begin to expand and run up the tube, pushing the indicator in front of it. When you withdraw the bulb from the water the mercury will cool and run down again, but the indicator will remain unless much shaken, for it is made to fill the tube very exactly. Now take hold of the thermometer by the end of the tube and shake it with a little downward jerk of your hand. Do this once or twice if necessary, until the indicator is down at 95 degrees or 96 degrees. Wipe your left

armpit with a soft warm cloth, put the bulb of the thermometer well into the centre of the armpit, put your left elbow to your side, your hand up across the chest, and hold it firm and still. Most clinical thermometers now record in one minute, but the old-fashioned ones take five. Even supposing your thermometer is said to be a "one minute" one, leave it in the armpit for two minutes; then withdraw it and note your temperature—it will probably be somewhere between

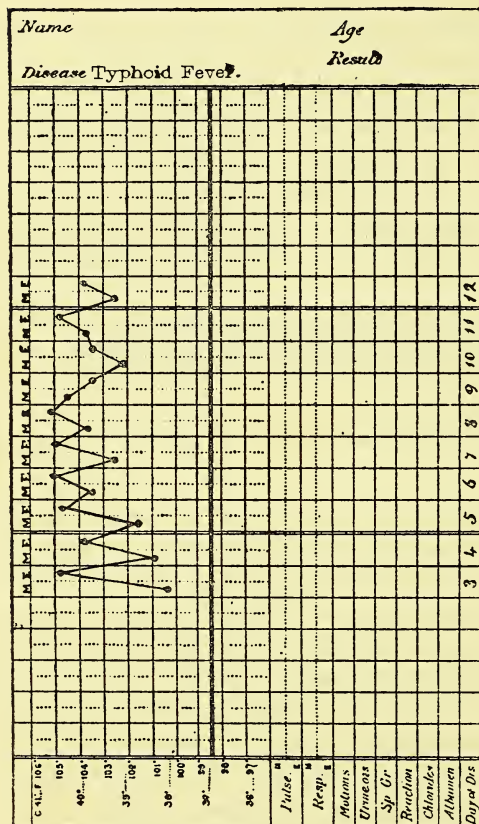


FIG. 31.—A Typhoid Record.

is well for the home nurse not to keep her thermometer in too constant use. Some mothers, having once found out how to use the clinical thermometer, are for ever sending for the doctor for the slightest feverishness in their children. If you do not understand the working of the clinical thermometer thoroughly from the above illustrations and description, ask the doctor to explain to you how to use it and how to chart your observations. It is better not to use it at all than to use it inaccurately.

98 degrees and 99 degrees. Rinse your thermometer in tepid water and put it back in its case. Doctors often take the temperature in the mouth, putting the bulb of the thermometer under the tongue, and telling the patient to keep the lips closed. But this is tiring to some patients, and there is always the danger of the thermometer being bitten, which might cause serious trouble. I advise the home nurse always to take the temperature in the axilla, unless the doctor orders otherwise. Charts, like weather-charts, can be bought for recording the temperature, and are very useful, as they show at a glance the variations of several days. Here is a typical record. Note that the temperature is nearly always higher at night than in the morning. Children's temperature is apt to run high for any little upset of the stomach, or slight chill; and it

Pulse.—The pulse, as a rule, is the doctor's province. Still, every woman should know that the normal rate for an adult is 72 to a minute; though in children the normal rate may be 100, and in old age the normal rate may be 50. As a rule, a pulse of 110 to 115 is called "frequent"; 115 to 140 is called "rapid," and over 140 it is called a "running" pulse, and the symptom is serious. You cannot count the pulse properly without a minute-hand to your watch. Then count two half-minutes, with a pause between; take the average between the two results and double it. For instance, the first half-minute you count 40; then talk to your patient, or turn your attention to something else for a few seconds, then count again. This time you count 44. Well, take 42 as the average; double it, and record the pulse at 84. Learn how to feel the pulse on your own wrist in times of health. Hold your left-hand palm up and bent slightly backwards; put the tips of the three middle fingers of your right hand on the wrist of your left hand below the thumb, and press gently. You ought to feel the steady beat easily. Get quite used to feeling the normal pulse, so that you can immediately put your fingers on the right spot and recognise quickly if the rate is seriously fast or slow, or if the pulse is "intermittent"—that is to say, if it misses beats now and then—a sign of exhaustion in some cases.

Respiration.—An adult usually draws sixteen or eighteen breaths to a minute; a child breathes thirty-six times, and an infant as much as fifty times. In counting the breathing, watch the rise and fall of the chest: if necessary place one hand lightly on the chest, but if the patient knows you are noticing his respirations it may increase the rate. Many doctors count the respirations when they pretend they are counting the pulse. In chest and heart diseases the breathing is often very rapid, but it is not only its rate but its character a nurse should note, in order to recognise when it is dangerously abnormal. The breathing is sometimes laboured, or irregular, or shallow; sometimes the nostrils dilate with each in-draw, sometimes there is "stertorous" or snoring breathing, sometimes there is the crowing sound of croup. The chief virtue of the home nurse is that she should know when to send for the doctor; and this can only be done by recognising the abnormal symptoms, and that can only be done by careful observation of the normal. Take every opportunity of counting the breathing of infants, children, and the aged, and sick folk: train your ear to note irregular sounds, train your eyes to see whether one side of the chest moves more than another, whether the breath is drawn from low down, or from high up, and is quiet and shallow: note in which position the patient breathes most easily.

Then if the doctor asks you a question you can reply: or if there is any great change you will at once perceive it.

Posture.—The eye trained to note in which position the patient breathes most comfortably, will also note the posture of the patient asleep. In exhaustion the patient is apt to constantly slip down and lies flat; in heart disease the arms are often thrown above the head. There is restlessness and constant changing sometimes, or again there may be a persistent desire to turn on one side. All these things may interest the doctor, and will help you to know how to make your patient most comfortable.

Evacuations.—Keep a record of how often the bowels are moved, and notice the amount, consistency, colour and smell, and if they contain slime, blood, worms, or anything abnormal. The bowels should be open once a day; the term diarrhoea is generally used for loose evacuations taking place six times in the twenty-four hours. In infants the bowels should be open two or three times in the twenty-four hours, and the motions should be yellow-ochre in colour and semi-solid. If you have to keep the motion for the doctor's inspection, put it in a glass jar and put a cover over the mouth; do not add any water or disinfectant. If there is sudden sickness, and the vomit is unusual in appearance, it is always well to keep it for the doctor to see. The bladder of an adult generally evacuates about fifty fluid ounces of urine in the twenty-four hours; a child only passes about fifteen ounces, and an infant ten. Here also note colour as well as amount, and if there is pain in the passing. Never imagine that any of these things are not your business, or that there is immodesty in attending to any of the patient's needs: the nurse who does not attend to these things may be left ignorant of some very serious symptom, and then the medical man in his turn may remain ignorant of it, and a fatal ending result. In the same way, if the friend in charge who is acting as nurse does not wash the patient and change the linen herself, she may fail to remark some rash, or never know about some heavy perspiration. Remember Christ not only healed the sick, but with His own hands He washed the feet of His disciples. There is no duty that cannot be done nobly and humbly when it is done to serve the sick; and the greater the nurse the more perfectly and simply will she perform all that is necessary. Think of the patient first, and remember that it will make his helplessness more terrible to him if you show any disgust or unwillingness to wait on all his needs.

Remedies and their Administration—Medicines.—Keep your medicines in one place out of the patient's reach and sight, and never put lotions or external remedies in the same place that you put

medicines that are to be swallowed. Always read the label of the medicine bottle before pouring out the dose; always measure very accurately; be sure your medicine glass is quite clean, and administer all remedies with the utmost punctuality. If the medicine is unpleasant give the patient a drink of water before and after, and give him a clean napkin to wipe his lips. With a child, and sometimes with an adult, it is well to give a sweet after if the doctor does not object. If a patient ever refuses to take medicine there is some fault, not in the medicine, but in the nurse. The fact that the nurse is devoting herself to the service of the patient should always give her sufficient moral control to ask the patient with quiet confidence to do whatever is considered necessary for his good. In these days of technical training, it is well for even the home nurse to know that one fluid ounce (written fl ʒj) is about equal to two tablespoonfuls; and that one drachm (written ʒj) is about equal to a teaspoonful; that one minim (written ℥j) is about equal to one drop—though this does not give the absolute accuracy that ought to be used in medicine giving.

Medicine ordered to be given three times a day should be given at 9 A.M., 2 P.M., and 6 P.M. Cod liver oil, arsenic, and iron should be given after food; quinine and purgatives before food. Sleeping draughts should be given the very last thing after all arrangements have been made for the night, and the house is quiet: it is a very serious thing to disturb a patient who has been secured sleep by some soporific. It is perhaps well to warn the home nurse that salicylates are depressing to the spirits; and that very often when a patient is taking them he will cry without cause. In giving castor-oil, remember a child should only have half the dose given to an adult. As this medicine is peculiarly nauseous, it is worth while to do your very best to disguise the taste. Rinse a wine-glass round with coffee or fresh lemonade, and leave a little in the bottom of the glass; pour the oil slowly into the centre of this, and pour a little of the coffee or lemonade on the top; tell the patient to hold his nose and swallow at one gulp, and then give him a piece of bread to eat before he releases his nose. Cod liver oil can be given in the same way, or else beaten up in strong coffee.

There are several cases of poisoning on record due to the nurse either leaving carbolic acid or some other poison within the patient's reach, or else putting lotions and disinfectants in the same place as the medicine bottles. Therefore, remember your responsibility, not only with regard to administering remedies, but with regard to their safe keeping.

Enemas.—A swift and simple method of securing evacuation of the bowels, is by means of an injection of warm soap and water into the

rectum. This can be done by an enema syringe, such as can be bought for two or three shillings at any chemist. It consists of a hollow ball from which go two tubes; at the end of one tube is an ivory nozzle for inserting into the rectum.

Put a pint of hot water in a small bowl, and add enough soft soap, or rub down enough yellow soap, to make the water creamy. The temperature should be 90° F. Oil the ivory nozzle to insure its easy insertion. Let the patient lie on his left side at the edge of the bed, with the knees drawn up; put a folded towel under his thighs. Put your bowl on a chair beside the bed, put the plain end of the syringe in the water, and squeeze all the air out of the bulb with your right hand, now release the bulb and the water will be sucked out; squirt the water back into the basin through the nozzle by again compressing the bulb, then once more release the bulb and refill it. Now insert the oiled nozzle gently into the rectum; use no force. Slowly and steadily, by squeezing and releasing the bulb, inject the contents of the basin; when the water gets low, be careful that the end of the tube is well immersed, on no account must you suck up and inject air. Gently withdraw the nozzle, holding it upright (or some of the contents may soil the sheets), roll up the towel and press it against the rectum to assist the patient in retaining the enemata. The fluid ought not to return for five or ten minutes, if it is to produce satisfactory results, but the bed-pan should always be at hand. Sometimes you are ordered to give an ounce of castor-oil mixed with the soap and water, or, in cases of diarrhoea and dysentery, a restraining enema of two ounces of cool starch may be ordered; a glass syringe is best in these cases. Nutrient enemata are nearly always given by the doctor; they are for the purpose of feeding the patient when nourishment cannot be taken by the mouth. The duty of the nurse will be to prepare them exactly to order, and to stand by ready to help the doctor, or hand him anything he may ask for. Eggs, peptonised beef-tea, and cream are the usual materials. A trained nurse never uncovers a patient in order to administer an enema, but a home nurse must never risk anything for the sake of appearances, and, if she is not quite certain of herself, she must act by the eye. It is better to familiarise yourself with the enema syringe in times of health; but the constant giving of enemata to relieve ordinary costiveness is a mistake.

Suppositories for introduction into the rectum or vagina are conical shaped, and the drugs or nutrients they are made of are cased with gelatine. They should be oiled and inserted gently, and pushed fairly far up.

Poultices.—To make a linseed meal poultice you require a piece

of old linen or calico the required size and shape, which should be warming on a tray before the fire; a kettle of boiling water, linseed meal, a bowl, a spatula or knife, and a little olive oil. Warm the basin by pouring in a little hot water. Pour this off and put in the required amount of boiling water—only custom can tell you just how much this is. Then stir vigorously with the spatula in your right hand, whilst you freely sprinkle in meal with your left. As soon as the mixture is the consistency of porridge, pour it on to your linen, and spread it rapidly with your spatula to the thickness of half-an-inch over the linen, leaving an inch uncovered all round. If you dip your spatula frequently in hot water, you will be able to spread more swiftly and smoothly. Turn up the spare edging of your linen, so that it covers the edges of your linseed, smooth a little olive-oil over the surface, and apply it as warm as the patient can bear it—try it with your wrist first. Cover it over with a piece of thick flannel or macintosh, and bandage on firmly but not tightly. A poultice made like this ought never to adhere to the skin in the least. Prepare your patient as far as possible before making the poultice, and, if he already has one on, when you remove it, lightly dry the part with a warm soft towel, and slip the fresh poultice on immediately. Large poultices may be left on four hours, small poultices should be changed more frequently. Poultices applied to wounds must be light and thin, and not covered with macintosh; very often charcoal sprinkled on the surface of the linseed meal is ordered if the wound is offensive. A little laudanum sprinkled on the poultice is ordered sometimes to soothe pain. When a mustard poultice is ordered, the mustard should be mixed with two parts of linseed, and the mixing must be very thorough; cover the surface of the poultice with thin muslin or rag, or with tissue paper, before applying it. All these poultices can be spread on brown paper if necessary, and for practising poultice-making brown paper should always be used. Let me once more repeat that the “home nurse” should do her practising in times of health, and not wait till illness comes along before she makes her first poultice.

A bread poultice is made by stirring up stale bread-crumbs in boiling water, spread on white rag. Smear surface with oil, and apply next the skin. Bran in a flannel bag makes a light poultice; and oatmeal has been used in an emergency. For mustard plasters the leaves that can be bought at any chemist’s are best; but, failing these, a little fresh mustard spread on brown paper and covered with tissue paper does very well. They should not be left long enough to blister unless the doctor specially orders it. Old folk and children blister very readily. A soothing dressing,

such as vaseline, may be used subsequently, if the skin is very red and sore.

Fomentations.—A fomentation is a piece of folded flannel wrung out in boiling water and applied as hot as can be borne. It needs covering with a piece of mackintosh, or *spongio-piline*. This latter is a wool stuff with waterproof backing that can be bought at the chemist's, and can itself be used as a fomentation. But it is expensive and soon spoils if constantly wrung out. To prepare a fomentation place a towel over a basin and put your folded flannel on the towel. Pour the boiling water over the flannel, and then take the two ends of the towel and twist them opposite ways—this is the only plan by which you can properly wring out a fomentation without burning your hands. Take the twisted towel to the bedside and do not open it out till the last minute. In cases of severe pain a few drops of laudanum may be ordered to be sprinkled on the flannel before applying.

In all cases poultices and other warm applications leave the skin particularly sensible to cold, so, on their discontinuation, some cotton wool should be worn for a time over the part.

Blisters.—The old-fashioned “fly-blisters” was apt to cause unnecessary pain, because it was fastened on by a circle of plaster, and, as the blister rose under this plaster, there was an unpleasant stretching of skin. So now, where the doctor can trust his nurse, a “blistering fluid” is usually supplied, which can be painted on with a brush. Of course, with a careless nurse, this fluid might be allowed to drop or run down where not wanted. Be sure you understand *exactly* where the doctor wishes the blister applied. If necessary, ask him to outline the place with a little ink, and if you outline the part with a little oil you prevent the blistering fluid from running down. A blister takes from four to ten hours to rise. When it has well risen hold a soft towel under it, and snip the lowest part of bulging skin with a pair of sharp, clean scissors. The water will then all run out into the towel; press gently over the skin to assist this. The subsequent dressing will be ordered by the doctor, but as a rule it consists of lanoline or some soothing ointment on lint, applied over the skin. Never remove the skin raised by the blister unless told to do so.

Ice.—When cold is wanted as a remedy it is usually procured by the means of thin rubber bags filled with ice. Do not crush the ice—split it with a packing needle or other sharp point—for if the ice is too small it melts and gets warm at once. Ice-bags need a piece of thin flannel or lint between them and the skin, except when they are applied to the head; then the hair acts as a protective. Be sure

your ice-bag is always a cold agent—it needs constant attention and refilling to ensure this. Ice is sometimes given to patients to suck, to arrest internal bleeding or sickness, or to relieve an inflamed throat. It is best kept ready for these cases by tying a piece of fine flannel over the top of a basin and putting several bits of ice of a convenient size on the top of the flannel. In this way the water drains through the flannel as the ice melts.

Cloths rung out in iced water, or lint wet with some evaporating lotion are also used to procure cold; the great thing to remember is that they need constant changing or they get lukewarm and do more harm than good. Supposing you are applying cold to the forehead for instance, have two handkerchiefs, one on the patient's head and the other in the basin of lotion ready to change.

Baths.—Baths, when ordered medicinally, must be prepared with exactitude and care; the only thing to give here is the general rules as to time and temperature :—

Cold douche	50° F.	4 minutes.
Cold bath	60°	5 „
Tepid bath	88°	14 „
Warm bath	95°	14 „
Hot bath	100°	10 „

Always use a bath thermometer. Do not leave your patient alone in the bath; have a large soft towel ready for his getting out. If you fear collapse have some brandy at hand. In case of a male patient the nurse can prepare the bath and keep the time, and a brother or male friend can immerse the patient; or the patient can wear a bath towel. But remember the bath has to be *kept* at the ordered temperature. With children it is often well to put them in a bath wrapped in a towel—it saves shock if the bath is very hot or cold, and saves fear where the child is nervous. In cases of great weakness a patient can be gently let down into the bath in a blanket; but this needs three attendants—one on each side and one at the top to keep the head well up out of the water.

If ordered to put mustard in a hot bath, tie the mustard up loosely in a piece of flannel and swish it about in the water—don't put in a loose handful.

Hot air and vapour baths need a special apparatus, with which instructions are issued. They cause excessive perspiration, and the nurse must watch for collapse, and watch also to prevent any subsequent chill. As a rule the patient needs sponging rapidly all over after a vapour bath, before the blankets are removed. A cane chair with a lamp under it has been used for a hot air bath; or a cane chair

with a foot bath and boiling water under it for a vapour bath—the patient sitting on the chair with a blanket pinned round his neck and falling over the chair on to the floor, and carefully arranged not to let out any of the steam or air. But these expedients are not very safe in amateur hands.

Food, and its Administration.—Nothing is more important in nursing than to secure that the patient takes a sufficient amount of suitable nourishment. Miss Nightingale is responsible for the statement that “patients are often starved to death in chronic cases,” and a large proportion of her little book is taken up with the consideration of the nurse’s duty with regard to feeding her patient. Food needs to be administered with as much exactitude and punctuality as medicine, but because of its frequency and greater bulk, it needs even more tact and care. Always bring the exact amount of nourishment to the bedside absolutely to the minute; serve it daintily on a handy little tray with the cleanest of linen and a few flowers if possible, and never talk about it more than is necessary. Do not leave the food in the room in the hope that the patient will take it “by-and-by”; if it is refused take it away and tell the doctor, and try and suggest some better course. I cannot do better than quote Miss Nightingale on this point: “To the large majority of very weak patients it is quite impossible to take solid food before 11 A.M.; for weak patients have generally feverish nights and in the morning dry mouths. A spoonful of beef-tea, or arrowroot and wine, or egg-flip every hour will give them the required nourishment, and prevent them from being too exhausted at a later hour to take the solid food which is necessary. Again, a nurse is ordered to give a patient a teacupful of some food every three hours. The patient’s stomach rejects it. Then let her try a tablespoonful every hour, or if this will not do, a teaspoonful every quarter of an hour.” Further on Miss Nightingale points out that often patients crave for things which are not in their dietary, but which when given are found to agree with them. Then Mrs. Ernest Hart has written: “There are two fluid foods, to one of which, or to both, a sick person is immediately condemned, namely, beef-tea and milk; and he may be kept on beef-tea and milk till he perfectly loathes the sight, smell, and taste of these foods. It will be, however, my object to show that there are cunning ways of treating these articles of dietary which will make them more palatable to the patient and more valuable as foods.”

In fact the nurse must use her brain—her imagination—her tact—to get her patient properly fed, and at the same time never

fuss before him with regard to food. As a rule men object to milk and children to meat, and women crave for tea. Then one has to nurse vegetarians sometimes, and it is wise to know the vegetable as well as the animal foods which give the two necessary supplies :—

BODY WARMERS.		FLESH FORMERS.	
Animal.	Vegetable.	Animal.	Vegetable.
Butter Dripping Suet Oil Lard	Sugar Treacle Bread Potatoes Oil	Meal Fish Poultry Eggs Cheese	Flour Oatmeal Rice Peas Barley

This may give some help as to what to substitute to suit a tired appetite. It is impossible here to go into particulars as to how eggs may be served, or beef-tea disguised as jelly, or cream substituted for butter. But remember that the furred and feverish tongue as a rule dislikes sweet and cloying things, hence the frequent demand for lemonade in the sick-room. A "fever diet" is generally supposed to consist entirely of milk and beef-tea; should either of these be refused ask leave to substitute veal-broth or raw meat juice, or to use wine whey or junket flavoured with lemon. Meat jelly and light custard pudding is the next step. The first solid is usually bread and butter and boiled white fish—a little filleted sole for instance. Then one gets on to poultry, and then to mutton chops. Sick-room beef-tea is made as follows: Take one pound of rump steak, remove all fat, and cut up into small pieces; place it in a stone jar with $1\frac{1}{2}$ pints of cold water, and add a little salt and a couple of peppercorns. Put in oven for three hours, or steam over fire in a saucepan of boiling water for three hours. Allow it to get cold and remove the fat. Stir up, and, holding back the pieces of meat with a fork, pour into an enamelled saucepan and heat as required. This should yield a pint of beef-tea. If you wish it to jelly use shin of beef instead of rump steak, put in bones and all, add 2 pints of water, and leave in oven for four hours.

Cold milk is not easily digested by some people, unless lime-water or soda-water be added. Hot milk is generally useful in these cases, and is a stimulant. Keep your milk sweet and in a cool place—ice may be necessary. If you are using a feeding-cup for your patient

be sure the spout is quite clean. Often the spout becomes brown and furred and makes everything taste sour. And remember, if you by giving your patient sour milk turn him against his food, you have done him a serious injury.

Never talk to a weak patient whilst he is eating, or allow visitors in. See that he is in a comfortable position before you give him his food, and be sure and have a table-napkin for him. A nightshirt or sheet on which beef-tea has been dropped is quite enough to spoil an invalid's appetite. Note if the effort of feeding himself tires your patient, and tactfully manage to feed him if necessary. Often a patient will take twice as much without noticing it, if the nurse supports him skilfully with one arm, and with the other slowly and regularly puts a full spoon to his lips.

Bed-Sores.—When a patient is long in bed the constant pressure on certain parts is apt to start troublesome sores, known as bed-sores. They are always regarded as a sign of bad nursing, though in certain illnesses, such as paralysis, it is almost impossible to avoid them. Once formed they are very difficult to heal, and they are an excellent illustration of the old proverb that prevention is better than cure. You seldom know how long an illness is going to last, so never let a patient be more than a couple of days in bed before you take precautions against bed-sores. The parts most liable to be attacked are the lower part of the back, the heels, and the shoulder-blades. Be sure you wash the patient all over daily and dry carefully; after drying the buttocks pour a few drops of methylated spirit or strong eau-de-cologne into the palm of your hand and rub briskly into the skin, then powder with a little finely-ground starch or boracic powder.

Then be sure and keep the sheets straight and taut, and the patient dry; if he suffers from perspiration sponge the lower part of the back at night again, and dry and rub with spirit and powder again. Besides pressure, the two main causes of bed-sores are damp and creases. Thus, one of the advantages of the draw-sheet is that it can be easily drawn through so as to give the patient's back a fresh dry bit to rest on, and can be stretched when it gets rumpled. Try and get your patient to shift his position now and again when he is awake, and keep him turning on this side or that. In certain illnesses—such as severe heart disease—this is not possible, so ask the doctor for directions in dangerous cases. If you notice any redness or tenderness of the back or heels when doing the patient's toilet inform the doctor; the further precautionary measures rest with him. Circular air pillows to keep off pressure may be ordered, and here a careless nurse, by not keeping them in position, may make them pro-

ductive of harm rather than good. A thick coating of zinc ointment to prevent damp may be ordered in cases of incontinence. The nurse has to remember the causes of bed-sores and use the prescribed remedies intelligently. Once a sore has formed great cleanliness and careful dressing are necessary. The doctor will be sure to do the dressing at first and show you the way, but the simplest and most frequent method is to syringe the sore with a little weak carbolic and warm water, and then apply a piece of lint spread with zinc ointment, and fasten it in position with cross strips of the strong sticking plaster usually called "strapping." The best way of warming strapping so as to make it adhere is to hold the non-sticky side against a tin filled with hot water; but dipping it rapidly into very hot water is also effective. Collodion, Balsam of Peru, iodoform, and other dressings are often used for bed-sores; but it is for the doctor to prescribe the cure, as it is for the nurse, by securing cleanliness and dryness, and avoiding constant pressure, to procure the prevention.

Nursing of Special Diseases.—Apart from the main nursing points common to every illness, there are certain details worth referring to in connection with lung, heart, kidney, skin, eye, and nervous diseases, and also with regard to fevers, surgical cases, children, and the care of convalescents. Only let the nurse also turn to the medical pages of this book which refer to the illness in which she is interested, as she will find much fuller information there, and the larger her knowledge of the subject, the more intelligently will she be able to grasp the purely nursing points.

Lung Diseases.—To take lung diseases first: the chief are pneumonia, pleurisy, bronchitis, asthma, and consumption. *Pneumonia*, commonly called congestion of the lungs or inflammation of the lungs, needs very careful nursing. It generally begins with a shivering attack, or rigor, and pain in the side. The patient gets rapidly worse, and the "crisis" comes about the seventh day; then the feverishness may rapidly decline. The temperature will have to be recorded every four hours except when the patient is sleeping, and it is useful if the nurse can record the respirations also. The patient must be given plenty of fresh air to aid his difficult breathing, and yet well guarded from chill. Jacket poultices may be ordered, that is, big poultices covering both chest and back: they are best made in an old vest cut up the side and along one shoulder. Get help in changing them in order to do it swiftly, without weariness or chill to the patient. When poultices are not ordered, or when they are left off, a cotton wool jacket of the same shape should be worn: if cut out of gangee tissue it will be very light, and will be convenient to

let the doctor "sound" either the back or chest without much uncovering. It should have strings to tie on the shoulder and down the side. The chief necessity for this is that the patient can bear no heavy bedclothes over his chest to impede his difficult breathing, and will probably want to be propped up in a sitting position. The teeth and gums sometimes become encrusted with scales in this and other feverish illnesses; wrap a piece of clean linen round your finger, dip it in borax and water, and sweep well round the patient's mouth and free it from all matter. You will probably be ordered to give about five ounces of milk or beef-tea every two hours. The patient may become delirious, especially about the fourth night; generally it is only a little "wandering" coming on towards evening, but in some alcoholic cases the delirium is acute, and the patient tries to get out of bed: in these cases be sure you have help within call, and that you never leave your patient alone for an instant. Too many cases have occurred of a patient throwing himself out of the window "during the nurse's absence"—they all reflect discredit on the nurse. As the crisis comes on watch carefully for any sudden descent of the temperature with collapse, blueness, and faltering breathing; this must be met by hot blankets, hot bottles and stimulants. The temperature ought to fall together with a sound sleep and heavy perspiration; then the patient awakes weak, but practically cured. But cases of relapse do occur, especially with careless nursing, so go on recording the temperature so long as the doctor visits. There have been several regular "outbreaks" of pneumonia, which seem to point to its infectiousness; therefore use a little disinfectant in washing out the expectoration cup, and do not let unnecessary visitors into the room.

Pleurisy needs much the same nursing care, and in good cases follows the same swift course; but the decline of temperature is not so sudden. The nurse may have to paint iodine on the afflicted side; or blistering fluid may be used. Spare the patient every possible exertion.

Bronchitis may be acute or chronic. The temperature can be recorded thrice daily—it seldom runs high, except in children. The room must be kept at a temperature of 65°, and a steaming kettle will help to moisten the air and ease the patient. Special kettles, with a long spout coming out of the lid, are made, but a brown paper spout fitted on to an ordinary kettle does very well. If inhalations are ordered, a jug with a narrowed orifice should be used, and the patient should put his mouth close down to the opening and breathe in all the steam he can. Bronchitis is liable to recur, so take special care not to hurry the convalescence.

Asthma is a nervous trouble, as well as a lung disease ; it is well to remember this, and whilst doing all you can to prevent attacks, or to relieve the patient's distress during an attack, do not coddle. Paroxysms of breathlessness come on very suddenly, sometimes in the night, so always have the prescribed remedies at hand—they usually consist of inhalers or medicated cigarettes. In some patients to sit by an open window will do good ; in others a drink of hot milk helps. These are most distressing cases to nurse, but they are seldom fatal. A hand on the patient's forehead may help him, or the supporting in a forward bending position ; but unfortunately the nurse can do but little whilst the struggle for breath continues. A heavy supper, a ride in a close railway carriage, or other existing causes may, however, be noted by those who are observant, and the patient warned to avoid them.

Consumption, or phthisis, is known as the scourge of our country, and causes an immense death-rate, particularly in certain trades. It is a lengthy illness, and can often be best nursed at home if there is a sensible woman in the house. The two main points for the nurse are to secure the patient all the fresh air possible, and to prevent the illness from spreading to others. The doctor may order that the patient be forced to take a certain amount of food, and a certain amount of exercise ; in these cases the nurse will have explicit directions, and has only to see that the patient obeys. The temperature, the respirations, and the weight should be kept recorded ; one of the best signs is an increase in weight. The heavy night perspirations are often a great discomfort to the patient, and only those who have endured them know the relief that ensues if "nurse" comes with warmed clean nightshirt, and warmed soft towel to wipe the patient, and makes him dry and comfortable without chilling him. But the nurse must not sleep in the room with the patient ; she must sleep in an ante-room, and leave a bell by his side ; and she must secure a draught of fresh air continually blowing between herself and the patient. In foggy, smoky towns the fresh-air cure is a mere misnomer, and this will surely be recognised when the present enthusiasm wanes ; it is the dryness and purity of the air of the Rocky Mountains or of the Engadine that has worked wonders, and if the nurse has to tend her patient in damp, dirty air, let her try to make it as clean and dry as possible. Hot water pipes just under the open window, a good fire, on very foggy days a thin screen of cotton wool for the outer air to filter through will help. A piece of fine net over an open window in London will in a few hours collect enough dirt to clog the lungs of the healthiest man.

The amount of food taken often depends on skill in cooking and

serving. Dr. Humphreys says:—"The diet has to include plenty of fats, farinaceous and nitrogenous diet. The dieting on the Continent of a patient will be much as follows: Principal meals at about 7 A.M., 1 P.M., and 7 P.M., that is breakfast, lunch, and late dinner or 'early supper.' Additional meals at 10 A.M., 4 P.M., 9 P.M., of eggs or milk. In the principal meals (the greatest attention being paid to the likes and habits of the patient) the great thing is to have several courses of well-cooked food. Meat is the most important thing, the supplies of food being given frequently, and meals not being large. The amount of milk taken in addition to the principal meals being about two to two and a half pints per diem."

Consumption is now supposed to be contagious, so that the patient should be discouraged from kissing, and all his pocket-handkerchiefs, towels, sheets, &c., should be strictly for his own use, and should be soaked in one in fifty carbolic before being sent to the wash. If he uses a spittoon, see that a little disinfectant is kept in it, and wash it out with sanitas, lysol, or some other bactericide. Japanese pocket-handkerchiefs and table-napkins made of paper are to be recommended; they are extremely cheap and can be burnt after use. Teach your patient never to spit on the pavement or floor; let him use his handkerchief, or carry one of the little pocket-spittoons now made: also teach him to hold his handkerchief before his mouth when coughing. Soft woollen underwear and woollen sheets are usually ordered; whilst keeping the patient warm, be sure he is lightly clothed—a fur coat, for instance, is not advisable.

Sudden attacks of bleeding from the lungs—the blood coming out of the mouth—occur in some cases, and are very distressing to all. Put the patient flat on his back, if his breathing will allow of it. Anyway, make him lie down and be very quiet, and try to relieve his anxiety by being very calm yourself. Send for the doctor. Do not give stimulants. Turn his head slightly to one side, and hold a vessel under his mouth, and have plenty of handkerchiefs to wipe his lips, for he must do nothing for himself. If possible, give him small pieces of ice to suck, or let him sip very cold water. Sometimes the doctor leaves directions that in such an event turpentine may be inhaled from a piece of lint, or leaves a special medicine to be given. But it is in an emergency like this that a capable woman is invaluable. Remember that cold and quiet are the best ways of stopping the bleeding. Where cure is not granted, the last months of this illness call for all a nurse's thought and self-sacrifice. She has to watch against bed-sores, foster the feeble appetite, guard the failing strength; and all with that cheerful patience which gives the patient a sense of support and restfulness. Yet she must never forget her

own health, and the health of others. She must never run unnecessary risks, or grow careless with regard to contagion.

Heart Diseases.—It is not necessary here to enumerate the different forms of heart disease, but there are certain nursing points common to all heart cases that call for particular attention.

First, the avoidance of sudden movements. In certain cases, such as aneurism, the patient may be feeling fairly well, and may think it very hard lines not to be allowed to leave his bed. A frequent source of danger is no one being at hand to give the bed-pan, or the patient preferring to get out to the commode, and doing so in the nurse's absence. Great care must also be taken in lifting patients, and in bed-making (see p. 180) to avoid sudden change of posture. All excitement, also, must be rigidly excluded from the sick-room, both joyful and sorrowful. There must be no bursting in with good news, no jokes which provoke excessive laughter. The nurse must train herself to a sedate cheerfulness, and must try and turn her patient into a philosopher.

Secondly, serious fainting attacks must always be apprehended, and prescribed remedies kept at hand. If no special orders are given, always have brandy within reach, and in the case of a fainting attack send immediately for the doctor; admit air freely and pour cold water over the patient's forehead, and hold salts to the nose.

Thirdly, it is essential that the patient should be propped in the most comfortable position. Sometimes he has to sit up in a chair, and this complicates the nursing enormously. Sometimes a bed-table (with a pillow on it) that he can lean forward against gives relief; but as a rule a bed-rest and sensible arrangement of pillows is sufficient.

Fourthly, it is extremely important to report very accurately to the doctor all symptoms. Strong remedies are often tried in these serious cases, and if a patient feels faint it should be reported, and the character as well as the number of the motions should be noted. Frequent watery evacuations are often desirable, and in all these cases constipation is to be avoided, as straining might prove fatal.

Fifthly, it is necessary to say a few words about **Dropsy**, which is a not uncommon symptom in lengthy cases of heart disease. It begins about the ankles as a rule, and as it spreads upward causes much discomfort, and also makes the moving of the patient more difficult. Often the feet are easier if they are slightly raised in these cases. Always lift the limbs for the patient one at a time. When the dropsy becomes excessive a simple operation called "tapping" is resorted to and the water drawn off. This gives much temporary relief. In dropsical cases an air or water bed is almost essential.

Finally, as regards diet. Of course tea, coffee, excessive smoking, or anything which causes nervous depression, must be avoided. But also flatulence is one of the most distressing signs in heart-disease, and therefore the food must be light and easily digestible and not given in too large amounts at a time. Soups and liquids generally are to be avoided. The best rule on all points is, "When in doubt, consult the doctor."

Kidney Diseases.—The most common form of kidney disease is nephritis, or Bright's Disease; and there are two special nursing points that need attention.

In this, and in all forms of kidney disease, the nurse must note the amount and colour of the urine, and the presence of blood, pus, or any foreign substance in it. She will probably be asked to measure the amount of urine passed in the twenty-four hours and to keep a specimen for the doctor to test. Under these circumstances, vessels must be kept perfectly clean, and no water or disinfectant kept in them. Measure the urine each time it is passed and make a written note of the amount. If you have not a proper measuring glass marked out in fluid ounces, you must secure a pint or half-pint measure, and use that. The normal amount is about three pints in the twenty-four hours. The specimen for the doctor must be collected in a perfectly clean, dry vessel, and then put in a large medicine-bottle that has been well washed out with soap and water and then left to dry. The simple testing of acid or alkali reaction may be left to the nurse, and merely consists in trying if it turns blue litmus paper red, in which case it is acid—the normal reaction; or if it turns red litmus paper blue, in which case it is alkaline. The presence of blood in the urine, a symptom to be looked for and reported at once in nephritis, gives a dark, smoky appearance to the water and a brown sediment, and does not give a bright red appearance.

Hot baths in order to make the skin work freely and partly rest the kidneys are common. Put an extra blanket over your patient, slip his nightshirt off over his head, and pin the blanket round at the back of his neck with a safety-pin, lapping it well over, but also pin a big fold under his chin in front. He can now slip out of bed well draped in his blanket, and into a hip-bath; the blanket should fall all round the bath to keep in the steam. Never leave the patient alone in his bath. Put hot blankets in the bed and a hot bottle in it. When the time is up (and see that the bath is *kept* at the ordered temperature by adding hot water if necessary), let the patient get into the warm bed still wrapped in his extra blanket and without drying. Cover him up and let him perspire. A hot drink from a

feeder will help. After twenty minutes remove the extra blankets, dry the patient under the clothes with a warm soft towel, and slip on a warm flannel nightshirt. Chills are particularly to be guarded against.

Diabetes is, properly speaking, a disease of nutrition, but in that its main symptom is excessive excretion of urine, it can best be dealt with here. The urine varies in amount from six to thirty pints in the twenty-four hours, and it is most important it should be measured and watched. This is a long illness, and often the doctor entrusts the home nurse with a urinometer—a little glass instrument which when put into a vessel full of urine shows the specific gravity, which is often as high as 1030. The first special nursing point in this disease is careful observation of the urine, and accurate record of its amount and specific gravity. The second point is diet—a most difficult question. For bread and sugar and fruit stuffs are forbidden, and everything that contains sugar and starch. Gluten bread can be bought at Callard's, 65 Regent Street, London, and at one or two other places; it is specially prepared for these cases. It can also be made at home, so can almond bread. Take quarter of a pound of blanched sweet almonds and beat them in a stone mortar, mix into a paste with three ounces of butter and two eggs. Add the yolks of three eggs and a little salt, and stir well; whip up the whites of the three eggs and stir in. Place the dough in moulds and dry by a slow fire. Or if spread thin in buttered tins and baked quickly, it will give almond biscuits. Potatoes used to be strongly forbidden, but lately Sir J. Sawyer in the *British Medical Journal* has advocated their use, saying: "Giving potatoes to diabetic patients is one of the greatest dietetic advances of our times." If your doctor allows them, delicious bread and cakes can be made from potato flour in the ordinary way. Saccharine must be used instead of sugar in tea and in all foods where it is desired. Try as far as possible to replace the forbidden articles so that the patient may not miss them and begin and crave for them. Omelettes are allowed, and green salads and any sort of meat. This is a long illness, and patients are apt to get very morose and cross; the skin gets very dry, and if it is not carefully attended to, eczema or boils may occur. Thirst is often extreme; as a rule soda-water, hock, and claret are allowed, but not in large quantities; indeed, the thirst is better eased by short drinks than by long.

Skin Diseases.—Skin diseases one often has to attend to at home, and the first thing for the nurse to do is to get over the feeling of repulsion they cause, and all dread of contagion. With due care these diseases seldom spread, and a nurse should never show either

fear or dislike of any nursing duty whatsoever. Dr. Norman Meachen says that the prejudice against skin cases is easily conquered, and that personally he does not mind touching or passing his hand over any skin eruption. He goes on to remark that of course he immediately disinfects his hands by immersing them in a two per cent. lysol solution, or a 1 in a 1000 solution of biniodide of mercury. The most common skin disease is *eczema*, and great skill is necessary for the proper changing of the dressings. Ointments must never be roughly applied or rubbed on the skin, but are spread on strips of lint, which are gently laid on the eczematous surface, and lightly bandaged on with a gauze bandage. The dressing is changed every twelve hours—night and morning—and all the old ointment must be carefully washed away, and the surface left quite clean. If there are scabs, they must be softened with warm oil, or a small poultice if necessary, before the ointment is applied. It is never any use to apply ointment on the top of a scab. Never uncover much sore place at once; do the dressing a bit at a time. When you have a “weeping” or watery discharge case of *eczema*, extra care is needed, or the dressing dries stiff, and adheres to the scars. In such a case it must be gently soaked off with bran water, and the doctor must be told. He will probably advise a dusting powder or a cooling lotion, or different dressing that will not adhere. But be sure you preserve the utmost cleanliness, and never leave raw surfaces uncovered, as they offer as splendid a growing field for germs as does an open wound. Burn all old dressings at once, and disinfect your hands. Soap is generally forbidden, and much washing is to be avoided; sometimes bran may be used instead of soap, or the skin is cleaned with a little olive oil. Avoid direct sunlight or firelight on the parts. There is often some constitutional disturbance with *eczema*, so the general health should be noted; also the irritation is great and the temper may suffer. With children the hands may have to be tied up in lint bags to prevent them from scratching themselves. *Eczema* is often started in children of the poor by the presence of lice in the hair, and it is well to know that methylated spirit kills these pests, and also loosens the nits, so that they can be combed out; of course methylated spirit must not be used near an open light—such as a candle.

In all bad skin cases put a macintosh over the mattress, and, if the head is affected, over the pillow as well. Use your oldest linen, for some of the ointments, such as preparations of tar and chrysophane, stain the sheets terribly. See that all sheets, towels, handkerchiefs, &c., used by the patient are kept for his sole use, and that they are disinfected before being sent to the wash.

A good many of the more simple skin diseases, such as *acne* and

psoriasis might be avoided by wholesome living, hard outdoor work, and thorough cleanliness secured by simple soaps.

Of *lupus* it is only necessary to state that the one great cure at present is the Finsen Light treatment, and the basis of that treatment is that sunlight kills germs and stimulates the skin, and that an outdoor life is indicated for those who have had, or are threatened with this disease, or with any form of tuberculosis.

In all skin diseases remember to guard against any possibility of contagion; and remember that very strong remedies are often prescribed, and that as a rule the dressing should be the exact size of the sore it is to cover, and should not spread over any of the healthy skin.

Baths have been treated of elsewhere, but if you have to arrange a "continuous bath," remember with a little ingenuity to make a head-rest by tying a towel across the top of the bath and putting a cushion on it, and by making a table by putting a board across the bath on which the patient can write, &c.; life in a bath can be quite amusing! Of *ringworm* it is only necessary to say, pray call in a doctor, and don't waste time with popular and utterly useless applications, such as ink!

Eye Diseases.—There are certain contagious diseases of the eyes and eyelids which are not unlike skin diseases, in that they chiefly call for patient treatment, cleanliness, and the prevention of spreading.

Ophthalmia, popularly called "the blight," is a contagious form of inflammation marked by a discharge which must not be allowed to accumulate. Therefore constant bathing of the eyes with warm water, to which a little borax has been added, is necessary; in acute cases this needs doing every two hours. The patient sits in a chair and throws his head well back, the nurse stands behind him and with the finger and thumb of her left hand holds the eyelids apart, whilst with the right she dips little swabs of cotton wool in the water and gently washes the corners and eyelids, and then squeezes a little of the water so that it runs over the eyeball. Never use the same swab of cotton wool or piece of linen twice—throw each piece into a saucer when it has passed once along the eye; and burn directly the dressing is done. Put a towel round the patient's neck, and let him hold a basin or saucer against his cheek to catch the water that runs down. In the case of an infant or young child, it is necessary to have some one to hold the child's head and hands. Or the nurse can sit down and hold the child's head between her knees whilst the assistant holds the child's hands. Some doctors entrust the home nurse with a syringe, but it needs very gentle use; a squirt of water in the eye

might cause great injury. If ointment has to be put on the eye, a good plan is to use a paper spill to put it on with; camel's hair brushes are so difficult to keep clean, and the spill can be burnt every time. See that towels, sheets, handkerchiefs, &c., are kept for the patient's sole use and are disinfected. Always burn old dressings immediately you have finished, and thoroughly disinfect your hands. Never put your hands up to your face whilst you are attending to the patient. In bad cases the eyes are very painful, particularly if exposed to the light; it is therefore well to keep the patient in a dark but well-aired room. Eye-shades are not to be used except at the doctor's orders, as they foster contagion and prevent the air getting to the eyes. Also, never bandage the eyes except under medical directions. In putting drops into the eyes, with the finger and thumb of your left hand pull out the lower lid at the outer corner and drop the drop well in and on the lid, and then let go and tell the patient to shut his eyes and keep them shut for a few seconds. Don't let the "drop-glass" touch the eyelid itself, or you will have infected it.

Compresses for the eyes consist of little squares of lint or linen soaked in hot water, or iced water, as the case may be, and constantly changed. They are placed over the closed eyelids, or a dry compress consisting of several layers of sterilised gauze covered with a little pad of cotton wool may be used, and this only needs changing every twelve hours.

Nervous Diseases.—In paralysis remember the peculiar tendency to bed-sores, and be sure and never put a hot bottle to a paralytic case without several layers of flannel between the patient and the bottle. Note the urine with care, as if there is retention it may lead to inflammation of the bladder; note if the urine dribbles away. In your efforts to keep the bed clean remember that in some cases of paralysis the patient does not feel when the bowels have acted or the bladder has emptied itself; also he cannot tell when a change of position is necessary. The nurse has actually to feel for the patient in these cases where he has lost all sensation. In *sciatica*, *epilepsy*, *chorea*, *hysteria* and so on, remember that mental worry is the chief thing to avoid, and that it is for the nurse to surround the patient with a reposeful atmosphere. She can only do this if she is herself of a non-worrying nature, or has taught herself complete self-control. It is no use to try and take charge of a nervous case if your own nerves are in a state of irritation; that is why it is that cases of hysteria generally do so much better away from their own family. In cases of *epilepsy* it is necessary to report the fits accurately to the doctor; note whether the onset is sudden or gradual, where the convulsions begin, and if the thumbs are flexed on the palm

of the hands, whether the patient remains conscious, the colour of the face, and the after symptoms. In *chorea* or St. Vitus's dance, a peculiarly distressing disease in ill-nourished or over-worked children, much patience is needed to secure quiet and fresh air. Never leave the patient alone; you will have to hold him all the time he is in his bath, or on the w.-c. Be very careful not to let the child have sharp or heavy playthings with which he can cut or knock himself; feed him with a spoon, and let him have a strong earthenware cup or tin mug to drink out of. His medicine also must be given in a plated spoon or tin cup; never in a glass. Remember the child is generally frightened at his own involuntary twitchings, and if he cries or ever has laughing fits, it is probably because he can't help it. If you can get the child's *brain* thoroughly rested and at peace, the bodily jerkings will soon cease.

Fevers.—Before dealing with the infectious fevers it is necessary to say a word about acute rheumatism, which is commonly called *rheumatic fever*. There are two points here on which the nurse needs warning. *First*, never to knock against the bed or slam the door, as the slightest jar may increase the agony the patient is suffering. *Second*, to be very careful not to let the patient make sudden movements, or leave his bed till the doctor gives permission; the heart is often affected in this illness, and therefore it is well to be very careful in the early stages of convalescence. A bed-cradle to keep the weight of the bed-clothes off the limbs, and woollen sheets and nightshirt are to be recommended.

Typhoid fever is an illness the cure of which rests largely with the nurse, and as it is only infectious through the stools and effluvia, it can be nursed at home if the doctor can trust the nurses completely—for it needs two nurses and constant attention. The room should be emptied of all heavy furniture and hangings, and a sheet soaked in 1 in 40 carbolic, hung over the door and kept thoroughly damp. The door must be kept closed and the window open. A room with a dressing-room where the nurse can keep her own things is best. It is as well not to let visitors into the sick-room, and to take every precaution against infection that would be taken in the case of other fevers. Carbolic must be kept in all vessels; all sheets, nightshirts, &c., must be soaked in 1 in 20 carbolic in a covered pail before being sent to the wash. Any food that has been in the sick-room must be burnt, and before she takes her own meals the nurse should wash her mouth out with a little myrrh and borax, and well wash her hands with terebene soap. It is well for the nurse to wear a washing dress, and cover her hair with a cap or handkerchief when she is in attendance on an infectious case. These garments must be changed when

she goes for her daily walk. The special point in typhoid cases is the disinfection of the stools and their proper disposal. If in a town and one w.-c. can be kept entirely for the sick-room use, the bed-pan can be washed and emptied in the w.-c. if always kept with carbolic in it, and more carbolic is added before it is emptied. Have a small mop for washing out the bed-pan, and keep it standing in carbolic when not in use. In the country it is never advisable to put the excreta of a typhoid patient into an earth-closet or into a w.-c. which drains into a cesspool. In these cases the nurse must bury the excreta in one part of the garden, which must be fenced off and left untouched. There is no need to bury them very deeply. Let the gardener dig a long shallow trench, leaving the loose earth and a small spade near, then the nurse can empty the pan into the trench and cover the part over with a couple of spadefuls of earth.

As typhoid spreads chiefly by contaminated water or milk, see that all drinking water and all milk is thoroughly boiled before use.

This disease is marked by ulcers of the bowels, and the patient is kept quite flat in bed and not allowed to sit up, because sudden movement has been known to cause perforation of the bowel at an ulcerated spot. Also the patient is not allowed solid food for fear it should cause perforation; and the nurse must keep the remembrance of these two points clearly before her. Personally I think it well to explain them to the patient, if an adult, for he is apt to get very weary both of the prone position and the sloppy diet. Observe whether there is any rash on the patient's abdomen, and note if there is any appearance of blood in the stools: the latter may be a serious symptom. Feeding follows the usual lines, except that some doctors give nothing but milk, and cut off the beef-tea. A teacupful of milk every two hours is then the rule, and this may be kept up for ten days or a fortnight. Typhoid is a lengthy illness, and any attempt to hurry convalescence may result in a relapse.

If *scarlet fever* is to be nursed at home it is essential to have a room well separated from the rest of the house. If it is possible to keep the top floor entirely for the patient and the nurse so much the better. Scarlet fever is one of the most infectious illnesses there is, and the chief nursing points are almost entirely connected with preventing its spread. Besides clearing the room and hanging a carbolic sheet over the door, the nurse must be most careful not to admit any one to the sick-room, and must not herself mix with the family, or go to church, or consort in any way with others. Letters must be fumigated or baked if written by nurse or patient: for scarlet fever is an illness which can be carried by paper, books, clothes, and so on. Most doctors like a linen wrapper kept outside the door, which they

can put on before entering the room. This wrapper should be soaked in carbolic after the doctor's visit.

Some cases of scarlet fever are very mild and are then called scarlatina, but they are equally infectious and need every precaution, for a severe case can be caught from a mild one. There is a good deal of sore throat generally with scarlet fever, for which cold or hot compresses may be ordered. In these cases there is difficulty in swallowing, and if the patient is a child much coaxing may be needed to get enough nourishment down. Feeding with a spoon is the best way. This sore throat may spread to the nurse unless she is careful to use a mouth wash and not eat in the room. If it does she should at once inform the doctor. The convalescence of scarlet fever is very long and wearisome; often the patient feels quite well at the end of the first week, and yet it may be a month before the "peeling" is over and he is allowed to go free. During desquamation it is best to rub the patient all over with lano-creolin, or some other disinfectant ointment, after his bath; this keeps the little bits of skin which are so apt to spread contagion from flying about. The feet and hands are generally the last to peel, as the skin is hard, and soaking in warm water and rubbing gently with a lubricant twice a day will help. This illness is particularly liable to leave complications, so the nurse should go on taking the temperature twice a day during convalescence; should notice if the urine gets scanty or the eyelids puffy, and if there is any discharge from the ears. These are all points to be reported to the doctor. But half the success of nursing this illness is to keep the patient amused whilst he is kept prisoner.

When the patient is proclaimed "peeled" and free by the doctor he should have a last bath with carbolic in it, and be well washed, *hair and all*. Then wrapped in a clean towel he should walk out of his prison into some uncontaminated room, put on a completely fresh lot of clothing, and go straight into the open air. For at least a week he should mix with others as little as possible, and spend his time out of doors.

The nurse should burn as much of the clothing as possible that has been used in the sick-room, but *take nothing out of the room whatever*. She should then have her bath and put on a complete set of clean clothing and go for a walk also. The disinfection of the room is now done by the local authorities, but in case this book goes into the wilds and the nurse has to do her best to disinfect, let her close up the room entirely—stuff up the chimney, paste over the window cracks, open all drawers, hang bed-clothes over chairs and turn up mattress, then tie a handkerchief over her mouth and nose,

light her formaldehyde lamp, and retire quickly and close the door. As scarlet fever is a lengthy illness there is always time even in the wilds to get a formaldehyde lamp or sulphur candles by parcel post from the nearest chemist. The breaking up of sulphur over hot ashes in a pail which was the old method of amateur fumigation, is now said to be useful only in so far as that it makes such a horrid smell that the room has to be well aired afterwards, and so ruins the furniture that it has all to be repolished. Certainly the very best disinfectants are fresh air and sunshine, so after leaving your room tightly closed for twenty-four hours, open all doors and windows and leave it to ventilate for twenty-four hours. Then set to work and wash it all out with carbolic, have it repapered and whitewashed, and if possible leave it empty for three or four more days. The mattress and pillows should be remade and thoroughly sunned. In small-pox, diphtheria, and all infectious illnesses, similar means should be taken to disinfect the room.

In *small-pox* the nurse must remember to so arrange the bed that the light does not get to the poor inflamed eyes of the patient: indeed it is usual to put up red blinds and only allow a dim red light into the room, and in this way much of the skin irritation is spared. Gentle sponging two or three hours a day with warm water will probably be ordered. Be sure you do not let the patient's mouth become foul and clogged in a serious case. With regard to disinfection extra caution on all points will certainly be taken with such very contagious disease. The nurse must be on the watch for delirium, and if necessary have help at hand; small-pox patients can be very violent.

In *diphtheria* if the nurse has to paint the patient's throat she should remember it is better done with one effectual sweep than with a lot of irritating little dabs. Try in health to paint your own throat with cold water, and you will soon learn how best to go to work.

Extra care with regard to burning all rags used for mouth and nose is necessary. Never allow any one to kiss the patient. Watch for the peculiar paralysis which sometimes follows, and which begins with the soft palate, so that fluids return through the nose when the patient tries to drink. Keep a note of the amount of urine passed. In these cases where there is difficulty in swallowing liquid, the patient will often take a sponge-cake soaked in milk, when he won't try a glass of milk. In all throat cases it is worth while to remember that semi-solids are more easily swallowed than liquids. In *mumps* and *quinsey*, for instance, this holds good. *Measles* are seldom treated seriously enough, and yet the death-rate, especially amongst infants, from measles is enormous. Keep the child in bed

Preparing for an Operation 211

and on liquid diet until the rash disappears. Keep away from other children for three weeks. Guard against chill, as lung disease frequently follows in measles. The main point to insist on here is that measles is an illness that needs nursing and that calls for disinfection and prevention of contagion.

Surgical Cases.—The home nurse is apt to have an unnecessary dread of the surgeon's knife, so that if some little operation such as excision of glands, or circumcision, has to be performed, a visit to a hospital is insisted on. Yet there is no need of this in such cases, and in other cases of sudden emergency there is often no time to move a patient, and the operation has to take place at home. The home nurse need not be afraid that she will faint or be sick, there will be too much for her to do; and if she does not think of herself, but of her duties and of the patient, all will go well.

See that your patient and your room are quite clean, and choose a room with a good light. Let your patient have a hot soap bath, and then sponge the part to be operated on with 1 in 40 carbolic or some other disinfectant, and put a pad of boracic lint over the part to keep it quite clean. Don't let the patient have a solid meal for six hours before the operation; give a little milk or beef-tea three hours before and nothing else. Chloroform is apt to make the patient sick, so you don't want him to have a full stomach.

Prepare your bed in the usual way with all clean linen and, if possible, clean blankets as well. Have a hot bottle ready for the feet, and, if necessary, a cradle to keep the clothes off the injured part. Prepare a table, in a good light near the window, by covering it with mackintosh and a thickly folded sheet. Put one small pillow for the patient's head. Have plenty of basins and pails, and hot and cold water, and plenty of clean towels in the room. Everything else he needs the doctor will bring. The nurse's duty will simply be to stand beside the doctor and hand him what he asks for, or do what he tells her.

The patient is given an anæsthetic nowadays for the most trifling operation, so there is no fear that all will not go quietly. But afterwards the patient may be sick and cold; so see that he is warm enough in bed—put on hot blankets if necessary—and turn the head slightly to one side, and have a small basin ready to hold under the mouth. Remember to cover your hot bottles with flannel, or you may burn the patient whilst they are still unconscious. If the patient is a little excited on coming to, do not be frightened; just calm him and keep him quiet. The after-dressing of the part will be done at first by the doctor. Watch carefully what he does, as it will probably be left to you later on. Directions in bandaging are not much good; the art of putting on a roller bandage can only be

learned by practice, and it must be learned on sound persons. But in all surgical dressings the aim is complete cleanliness and the exclusion of all germs. Remember this, and you will understand better what the surgeon is doing. Nothing dirty must ever go near a wound. Soiled dressings are removed by sterilised forceps and at once burnt; the wound is syringed with some germ-destroying fluid, and then sterilised gauze is probably put on, and the whole well covered up. If you have not forceps, use clean blunt-pointed scissors to remove the dressing. Never put your fingers near a wound if it can be avoided.

In cases of fracture and dislocation, remember that the nurse's chief duty is to keep the injured limb at rest in the position in which the surgeon has fixed it. In dressing these cases, the injured limb is always removed last from the nightshirt or night-drawers, and is always put in first to the clean ones.

Nursing Children.—Children when ill are apt to get well or to get worse very quickly; the nurse must therefore be very sharp in her observation, very ready to act. For instance, a sick child has diarrhoea: twenty-four hours' neglect of the fact may let the bowels get so feeble that subsequent remedies are useless and the child dies. That is the first point to remember—that a child has not such a stock of strength to fall back on as an adult.

Secondly, a young child cannot tell you how it feels, often cannot tell you where the pain is. We have all met with children who, when they were ill, have complained of the head when the foot was hurt, or vaguely put a hand to their cheek when obviously the pain was in the bowels. The nurse has got to *see* what is wrong with the child, and she has got to learn "the language of a cry." Here are a few observations on the cry of a child:—Slight pain, a moaning cry; severe pain, sharp paroxysms of crying; the movements and position of the child will show the nurse where the pain is. The hand will go to the head in earache; the child will "double up" if the pain is in the abdomen, and so on. In hunger, the child cries fretfully and sucks its fingers. In lung disease the cry is short and half-smothered, for the crying hurts. In temper the crying is loud, and the child stiffens itself and kicks vigorously. Supposing a child is crying fretfully and you feed it and it still goes on crying, then see if it has a wet diaper or cold feet; for the fretful cry means discomfort of some sort. Suppose, after the feeding, the crying begins again worse than before, indigestion is indicated. The "night cry" of a child with hip disease, who jerks himself in sleep, is very characteristic. By training herself on some such lines as these, a nurse can learn in time to interpret the cry of the child.

In the long cases of spinal disease in children which have to be nursed at home, and in all cases in which splints are used, be very careful to see that no rubbing of the skin is allowed. In many orthopædic cases the splints are immovable, but the nurse must look at them night and morning when washing the child, and if she sees the least sign of redness, rub the place with a little spirit and put in a little lint or cotton wool to protect it, and tell the doctor. Some splints are removed once a day, and then clean lint or cotton wool can be put where necessary. In lifting a child always keep the injured part away from you and lift slowly and gently. When a child is in a plaster jacket the same watching for any rubbing of the skin and redness is important. When splints get too small or tight, they interfere with the circulation of the limb, and the toe or finger-nails get bluish, and the toes or fingers begin to swell. This needs immediate reporting to the doctor. Numbness of limb is also a sign that needs reporting, as it may mean pressure on a nerve.

But after all the main thing in nursing children is to remember that they are little people who should naturally be enjoying free movement and innocent gaiety, and that they have no reasoning power or understanding of illness to make them patient. It is no use to argue with them. The nurse must try to get to their level and be in sympathy with them. Unless you love children, you cannot nurse them properly; a child deprived of love is like a flower deprived of light—it cannot flourish. The chairman of the London Hospital said to his nurses: “If you cannot make a doll out of a pocket-handkerchief, you must learn how. A nurse’s education is not complete without this useful accomplishment, nor do I feel sure that any woman is justified in calling herself *trained*, unless she can make boats and frogs out of paper. Can you tell stories to children? They like simple stories, with no stirring incident. The string I always play on is a child doing something to surprise and please its mother, or doing some unexpected kindness.”

Teach the child not only to love you, but also to rely on you; it is bad nursing to tell a child you are not going to hurt it when you are, or that its medicine is nice when it is nasty. Teach the child to be brave and truthful—and teaching is best done by example, so if you tell it lies, you are teaching it to lie. “I will only hurt you a very little for a very little time, sonny; be a brave wounded soldier now for a minute”; or, “Now let us pretend this is a glass of wine, and take it quickly, and then this sweet shall be the dessert afterwards.” It is sometimes a matter of life and death that the child should trust you. If you are always patient, always bright, always truthful, always gentle, and always brave, the child will reflect your

virtues, and be easy to nurse. But don't expect an old head on young shoulders; never forget your patient is "a little child."

Convalescence.—On first sitting up, a patient needs a bed-wrap which is easily put on; the best is a "nightingale," made out of two yards of soft flannel. Fold it in two, and quarter of a yard from the fold at the top, sew the two pieces together—this makes a sort of hood to fall down at the back. Now turn back the right lower corner about eight inches, and catch the two points where it turns back together—this makes the sleeve. Do the same with the left lower corner. Put it over your own shoulders, and slip your hands through the ends, and see how comfortable it feels. It only takes five minutes to make; it covers the patient well, and there is none of the difficulty in getting into it that there is in getting into a dressing-jacket. Pin it down the front with safety-pins.

On first getting up, a patient is liable to faint, and to try to do too much. Give your patient your arm during his first walk from the bed to his chair, and do not speak to him whilst he is moving. Be sure and do not let him stay up too long—an hour at a time is enough to begin with. Admit friends in the afternoon, one at a time; be sure and get the patient to bed early, and keep the evenings quiet. Friends towards evening often mean a restless night.

As the patient gets a little better he is apt to get irritable; so is the nurse. Guard against this—it is a pity, if you have kept your self-control all through the illness, to lose it now, and spoil your reputation. For the patient and his friends will remember your moment of temper, and forget your weeks of patience.

Death.—The two chief signs of approaching death are shallow, irregular breathing, and coldness of the hands, legs, and nose. If the breathing stops and you cannot feel the pulse, put a looking-glass close to the lips; if it remains undimmed the breathing has ceased. Feel under the left breast for the heart. As a rule the jaw drops in death, and the eyes remain half open. Put your hand gently over the eyes, and close them, and tell the friends all is over. Leave them for awhile, and then return and ask them to leave the room. If the eyes have not remained closed, close them again, and put pads of damp lint on them to keep them closed; take all pillows and superfluous clothing off the bed. Reverently wash the body over, and take off the nightshirt. Put on a clean nightshirt, and put clean sheets on the bed. Fold the hands over the chest, and put the body quite straight. Tie up the jaw with a bandage under the chin, and tied well back at the top of the head. Arrange the hair neatly; put a handkerchief over the face. Clear the room of all dirty linen, medicine bottles, and so on; open the window at the top,

and shut and lock the door outside. The jaw bandage can be taken off after two or three hours, when the jaw is fixed. Remember that inevitably you must die, and some one must do your last toilet for you. Therefore perform these last duties as you would be done by. Death is only the natural sleep after the life's work, and there is no reason to dread it more, or make more fuss about it, than about going to bed at close of the day.

SECTION X

ON PHYSICAL CULTURE

THE very earliest records of the ancient peoples, which have been preserved to us, contain references to systems of *physical exercise* which were employed in the treatment of disease, and also in maintaining the bodily health and improving the mental faculties. The Greeks brought the art to the highest state of perfection, and the *pentathlon*, constituting running, leaping, wrestling, throwing the lance, and casting the discus, were assiduously practised in their gymnasia; whilst swimming, boxing, and games of ball were indulged in as recreations. The Romans copied the Greeks in their amusements, as in many other things, and gymnasia were attached to most of their bathing establishments. In Japan, a system termed *jiu jitsu* has flourished for over 2500 years. Confined at first to the *samurai*, or military class, it is now taught to all who may wish to learn it. In India the *pahlwan*, or professional wrestler and athlete, is a welcome visitor in every village and hamlet, and has pupils whom he carefully trains in the mysteries of attack and defence, which have been handed down from one to another through time immemorial. All these systems, however, had one great fault, namely, that they were suitable only for the *robust*; when "might was right" the weakest went to the wall, and received no consideration whatever, bodily strength being the one key which could open the door leading to success, and the loss of which meant being quickly pushed aside by others, considered, on account of their physical attainments, to be more fitted for the work in hand. Thus, only those who were already strong could hope to attain to eminence in the Greek gymnasia. No system was ever thought of or devised for developing the *weak* and rendering them better fitted for their daily occupations. Amongst a warlike nation such

as the Romans, only such exercises were practised as rendered the people better fitted for war. In the Japanese system, admirable as it is, the exercises have to be carried out by *two* people, and the idea of attack and defence is present in them all. With the decline and fall of the Roman empire, physical education, as a system, became a lost art in Europe; and all through the Middle Ages, although the people, especially in England, indulged in outdoor sports and games, no thought was given to the *systematic* development of the muscular system. In fact physical culture, as we understand it to-day—that is to say, a training, exercising, and consequent development of the *whole body*, founded on physiological facts—is the growth of only the past hundred years, and to Peter Henry Ling, a native of Sweden, is due the credit of having, by the publication of his system of *free movements*—movements carried out to produce *specific effects*, in which the individual has only himself and his own weakness to contend against, and which, if carried out faithfully, more especially during the period of youth and early manhood, result in the student being possessed of a *strong arm*, a *stout heart*, and *clear brain*—placed the science of physical culture on a firm basis.

About Muscle.—To enable the reader to more thoroughly understand the effects of exercise on the body, and to help him to realise the absolute necessity that exists for the performance of systematic exercises, if the bodily health is to be maintained, he must know something about the functions of muscle and the chemical changes which are a result of muscular movements. *Exercise* may be defined as movements of the body, which are produced by the contraction of voluntary muscles, and which accelerate the *breathing* and the *heart's* action. In vol. i., p. 78, will be found a full account of the physiology of muscle, which renders only a brief notice of the subject necessary here. As will be seen by reference to the above section, striped muscle consists of bundles of fibres, which are surrounded by connective tissue, and bound by *tendons* to the bones upon which they act. The muscular fibres are richly supplied with both sensory and motor nerves—that is to say, they are in *constant communication with the brain*. A close network of capillary blood-vessels surrounds the fibres, and keeps them bathed in a nutrient fluid. It will be further noted that *contractility*, the power of becoming shorter and of again assuming its original length, is the chief characteristic of muscle, and the means by which all muscular functions are performed. The contraction of muscle may be brought about either by *nervous* or electrical stimulation, the muscle becoming both shorter and thicker. As the strength of the stimulation is increased, the contractions become stronger, but only up to a certain point; after passing which

they gradually diminish in strength, and eventually cease altogether, the muscle having become *fatigued*. With constant use a muscle increases in *size* and *strength*, and reacts more readily to nervous stimulation—that is, it is more *alert*; but if only a certain group of muscles be *over-exercised*, such as those of the legs in cycling or of the arms in rowing, that group will, after increasing up to a certain point, begin to *waste*. This cannot happen when *all* the muscles are equally exercised, because then no one group can be over-exercised. Every form of *energy* in the body, whether it be *muscular* or *nervous* or the production of *heat*, is the result of *combustion* in the body. Food is stored up in the cells, and these cells are burnt up by the *oxygen* which is present in the blood; thus every function is the result of cellular *death*. The products of combustion—the ash—is carried away by the blood and eliminated from the body by such organs as the kidneys, the skin, &c., and *new cells* take the place of those destroyed; and it is upon the frequency with which the cells of the body are renewed that its well-being will depend. As with the body in general, so with the muscles. Every movement means the death or burning up of a certain number of cells, and of new cells taking the place of the old; and the great effect of exercise, especially systematic exercise, is that the muscle cells are always new.

Muscular Work.—The bones of the body, together with the joints, form a series of *levers*, to which the muscles act as the *power*. All the three orders of levers are represented in the body, but the third is most frequently met with. Further, it must be borne in mind that most movements of the body are produced by more than one muscle, and that for any movement to be carried out properly all the muscles involved must act in harmony or co-ordination. The same rule holds good in performing complicated movements, such as dancing or skating, where muscles which have not been in the habit of acting in harmony have to be trained, by practice and exercise, to do so. Even such an apparently simple act as standing upright needs the co-ordinate action of a great many muscles of the trunk and limbs, all of them by their contraction, which is, however, so slight that it is imperceptible to the individual, helping to maintain the body in such a position that the line of its centre of gravity passes through the area of ground covered by the feet. The remark has just been made that the erect position is maintained by the contraction of muscles, which is however so slight that it is imperceptible. This contraction is termed the *tonicity* of the muscles, which means that the muscles are never relaxed to their fullest extent, but are always under a certain strain, a strain sufficient at any rate to counteract the effect of an opposing muscle.

What Exercise Does.—Exercise improves the *tone* of muscles; that is to say, their *tonicity* is such that they are ready to start work sooner than muscles which have not been exercised. But along with its effect on muscles exercise has a much wider influence, for as a result of the contraction of the muscles, and the consequent increased rate of combustion going on in the body, a larger amount of oxygen is required; and to supply this, not only is the *rate* of breathing quickened, but the *quantity* of air inspired is also increased, and this not only to supply the oxygen but also to remove the carbonic acid gas, which is one of the products of combustion. Thus, experiments show that if the quantity of air inspired whilst a person is in the recumbent position be taken as 1, in the erect position 1.33 will be consumed, 1.9 when walking at the rate of a mile an hour, and 7 when walking at the rate of six miles an hour. Whilst as to the *rate* of breathing, the ordinary rate of 16 to the minute is raised to 25 in rapid walking, and 36 in running. It is, however, not enough that oxygen should be present in increased quantities *in the lungs*; it must be more quickly supplied to the cell elements of the body: and to effect this, not only does the *heart* beat more *quickly*, it also beats more forcibly. Thus in the recumbent position the heart beats at the rate of 64 to the minute, it rises to 78 when walking slowly, and may be as rapid as 150 to the minute when running; and as to the more forcible character of the beat every one has experienced the “thumping” of the heart after some unwonted exertion. The contracting muscles themselves help to further accelerate the circulation of the blood by pressing on the *veins*, and causing a more rapid return of *venous blood* to the right side of the heart. Thus, the strong rapid beats of the *heart*, the quick deep expansion of the *lungs*, and the contraction of the muscles, result in an increased quantity of pure oxygenated blood being in circulation throughout the whole body, and consequently the whole system is benefited. The products of combustion being rapidly removed the *liver* acts better, the *appetite* is improved, the *digestion* is better. The *skin* being well supplied with blood, the pores are being continually flushed with perspiration, consequently its texture or *complexion* is improved. Owing to the close relationship which exists between the *nervous* and muscular systems, the former is greatly improved by exercising the latter, and the *brain* becomes more active, is possessed of greater moral and intellectual force, and can do better work.

Regulation of Exercise.—Finally, the goddess of exercise having bestowed upon her votaries the blessings of a strong pair of lungs, a strong sound heart, a good digestion, and a clear brain, cannot but add one more—*long life*—to those she has already conferred. One

word of warning, however, must be given as to the great risk attached to the *abuse* of recreative exercises. If individuals who pass the most of the year in sedentary occupations suddenly, and without any preparatory training, undertake violent exercises such as rowing, hill-climbing, or running, the heart is unable to drive on the blood quickly enough to the lungs, consequently its chambers become engorged with blood and its walls dilate and become *strained*, and permanent injury frequently results. The possibility of permanent dilation and hypertrophy resulting is pointed out in the section which treats of diseases of the heart (vol. ii.). Further, it must be borne in mind that the muscles always need *rest* after exercise. *Fatigue* is really a chemical process, consisting in the accumulation of the products of combustion in the tissues—tired muscles are *acid* in reaction, rested ones are *alkaline*; therefore it is essential that time should be given for the removal of the waste products and the return of the muscles to their normal alkaline condition. By carrying out a system of physical exercises throughout the year, individuals, and more especially those whose occupation is a sedentary one, will find that the risk of heart strain on undertaking violent outdoor exercises during their short holiday season is greatly diminished, and that a comparatively short period of training will render them “fit” for any rational undertaking. Whilst the object of this paper is to place before the reader the great benefit to be gained from systematic exercising of all the muscles of the body, he must not carry away the impression that any system of gymnastics, however scientific, can ever quite take the place of healthy outdoor recreations. Neither Ling nor any of the other less eminent founders of “systems” can give us anything to equal a walk amongst the hills, or a glorious swim in the sea, but they can teach us to render our bodies *better fitted* to undertake these latter exercises whenever we get the chance, without running the risk of injuring ourselves. The great disadvantage of outdoor sports, when taken alone, is that they tend to develop only a *certain group* of muscles. Thus we are all familiar with the enormous calves, flat chest, and round shoulders of the enthusiastic *cyclist*; whilst even in *rowing*, which exercises nearly all the muscles of body, those of the trunk and lower extremities have to do most of the work, and the respiratory movements are interfered with, as the ribs have to be fixed to give purchase to the trunk muscles. The same may be said of *running* and *jumping*.

Swimming is a recreation in which practically all the muscles of the body are called into play. The body is propelled forward, however, only by the *energetic* action of the extensor muscles

of the arms and legs, which press against the water and so push the body forward; the act of drawing the arms and legs close in to the body again, before the next stroke, not requiring anything like as much force, so that the *flexor* muscles are not exercised as much as the extensors. There are different methods adopted in swimming, but for long distances the *side stroke* is undoubtedly the best, its advantage over the ordinary *prone* position consisting in the fact that by lying on the *side* of the body, a smaller resisting surface is offered to the water. For rapid swimming the *overhand* or Indian method offers many advantages; it is however only suitable for short distances, being very fatiguing. Than *golf* no better form of recreation exists both for old and young, necessitating as it does the spending of a considerable time in the open air, and calling into play the muscles of the trunk and limbs, whilst, as every player knows, much of his success depends upon the brain work he puts into the game. On *boys* and *young men* cricket and football will ever retain their hold as games of skill which develop habits of *self-restraint*, *courage*, and *decision*, and the only advice to lovers of these pastimes that suggests itself is that they should always remember to "play up, play up, and play the game."

Systematic Exercises.—We pass from this rapid and very superficial survey of exercise in general to the consideration of the system of physical education, the foundation of which was laid down by Peter Henry Ling, and which is practised in some form or other in every civilised country. This system consists in a series of exercises which are *progressive* in character, as every form of education is, commencing with simple exercises, and passing *gradually* to more arduous ones. These exercises are divided into two classes, namely, those which are carried out without the aid of apparatus, and are termed *Free Gymnastics*, and those in which some apparatus such as dumbbells, parallel bars, horizontal bars, rings, &c., are employed. The *object* of the exercises is to improve the *health* and physique of the individual, to endow him with a sound constitution, and to render him strong, active, and *intelligent*. The principal *effect* is to benefit the *circulatory* and *respiratory* systems, every form of movement which contracts the chest being carefully avoided, and the importance of breathing through the *nostrils* with the mouth shut, and of making strong expiratory and inspiratory movements, is continually being impressed upon the student, and these movements encouraged by special breathing exercises, which consist in movements of the *upper extremities*, to develop the muscles of the chest. In addition to the effect produced on the respiratory system, certain of the exercises are *curative* in their effect. Thus, "Head and trunk backwards and for-

wards bending," by strengthening the muscles of the back, has a beneficial effect on *lateral curvature of the spine*, which is due to weakness of these muscles, but is frequently aggravated by the careless positions taken up by children whilst sitting at their work. Again, "Heels raising and lowering" and "Knees bending" strengthens the arch of the foot, and overcomes any tendency to *flat-foot* which may be present. Lastly, a certain number of exercises benefit the *nervous system*. By making the body take up unusual positions, such as "Hips firm, right leg sideways stretch, left heel raise," where the body has to be *balanced* on the ball of the left foot, the nerves are trained to *control* various sets of muscles, and make them act in co-ordination. In this way the nerves are trained to call into play muscles grouped in an unusual manner, and the muscles themselves respond more quickly to the nerve stimulus. Such *balance exercises*, as they are termed, greatly increase the activity and *intelligence* of the individual, and the arts of *skating* and *dancing* are much more readily acquired by those who have gone through a course of physical education than by those who have not had this advantage. The exercises, in addition to being progressive in character, are so arranged that every part of the body is exercised in turn, and they are divided into different *groups* according to their effect. Each group of exercises commences with a definite *starting position*, such as *Hips firm, neck rest*, &c., and it is of the greatest importance that it should be carried out with accuracy, as much of the efficiency of the exercise depends upon it; and, further, the effects of many are altered by changing the position from which they start. The following are the more important groups:—

Arm stretching exercises, such as *Arms sideways, stretch*, and so on, which exercise a beneficial influence on the muscles of the chest, and thereby increase its capacity. *Leg* exercises, such as *Heels raising, Knees bending*, &c., which by the contraction of the muscles of the lower extremities accelerate the flow of blood in the *veins*, thereby relieving the *heart* of some of its work. In addition, of course, they improve the quality of the muscles themselves. *Span bending* exercises, in which the spine is bent backwards, and the effects of which are to strengthen the muscles of the *back* and to expand the chest. *Heaving* exercises, such as climbing and hanging, the body being drawn up by the arms, which expand the chest and develop the respiratory system. *Balance* exercises, such as *Leg sideways, raising, Backward-stretching*, and so on, which, whilst they require little muscular exertion, benefit the *nervous system* and render the limbs more *supple*. *Flank* exercises, such as *Trunk bending* and *Turning*, have a beneficial effect on the *internal organs*

and also affect the flank muscles. *Abdominal* exercises, an example of which is given in Exercise IX. Pl. V. Figs. 6, 7, 8, exercise the muscles of the front of the body, and accelerate the circulation through the *abdominal organs*, thereby benefiting *digestion* and assimilation. *Breathing* exercises. Every exercise should have some beneficial effect on the respiratory system, but there are some of them, such as *Arms raising*, *Arms circling*, &c., which are carried out in *slow time*, about 16 to 20 times a minute, the same rhythm as ordinary breathing, and which are accompanied by deep inspirations and expirations. These exercises should be carried out at the end of a period of arduous exertion, as they have a *sedative effect* on the respiratory system, and restore the equilibrium between it and the circulatory system. Such are some of the groups of exercises which comprise *Free Gymnastics*, and it is only after these have been practised for some time that the student should go forward to the more arduous exercises which require some apparatus. *Dumb-bell* exercises are somewhat more severe than free gymnastics, because there is the additional strain on the muscles consequent on *gripping* the bells hard, as unless this is done and the exercises carried out with vigour, there is not much to be gained from them. A note of warning must be issued against the use of *heavy* bells, to which is attached the distinct danger of *over-exertion* and consequent *strain*. Bells weighing 2 lbs. are the heaviest that even the strongest man need use, and for boys light wooden bells are the best. It would, of course, be quite impossible here to give a complete description of all the movements practised in a course of physical education; this may be had from the many books devoted to that subject alone. All that has been attempted is to give a series of exercises which, whilst merely *illustrative* of the system, are such as may be carried out in the course of ten or fifteen minutes before the morning tub. They are such as have been practised by the author for the past twenty years, and have resulted, he believes, in rendering him better fitted for his daily work, and have certainly postponed that day, so distressing to the man on the wrong side of forty, on which it is discovered that the *waist* measurement exceeds that of the *chest*. The following *Rules for Measuring*, taken from the handbook of Physical Training issued by the Admiralty, may be of use to those who wish to note the effect of physical exercises on their development.

Height (without boots).—The position of "Attention," heels closed, knees braced back, chin raised, head held steady, shoulders square to the front; the heels, hips, shoulders and head touching the pillar of the standard. Taken to the eighth of an inch.

Weight (as dressed for gymnastics).—To a quarter of a pound.

NOTE.—The preceding two measurements when repeated should always be taken at the same time of day, and after the same amount of bodily exertion.

All the following to be skin measurements :—

Chest.—Position of “Attention,” arms hanging by the sides, the tape passed round the chest just below the nipples. To be taken to a quarter of an inch.

1. At the end of forced inspiration, where the lungs are inflated to their fullest capacity.

2. At the end of forced expiration, where the lungs are depleted.

3. Midway between the normal inspiration and expiration.

Measurements (1) and (2) give the chest expansion. Measurement (3) gives the normal chest girth. In this measurement care must be taken that the chest is not inflated beyond its usual expansion during ordinary breathing.

Waist.—The circumference of the abdomen two inches below the navel.

The following measurements to be taken to the eighth of an inch :—

Forearm. — The arm extended in line with the shoulder, fist clenched; the tape passed round the thickest part of the arm. This line will be usually found about two or three inches below the elbow-joint, but with men who have taken little exercise it will be found near the elbow-joint.

Upper Arm.—Arm extended and bent at the elbow, fist clenched and brought down to the shoulder. This should be done slowly, bending the finger-joints, clenching the fist, and bringing the forearm down upon the upper arm.

NOTE.—When the whole arm is fully developed, the difference in size between the fore and upper arm in an adult of medium stature will be about two inches, and it will almost invariably be found that when the upper arm is feeble, the upper region of the chest will be feeble also. With a chest of 40 inches, the arm would be probably 12 or 14 inches.

Calf.—The leg to be held stiff and straight, heels raised from the ground, the toes pressed strongly down, and the knees braced well back. The tape is to be passed round the thickest part of the calf, and as this line will somewhat vary with different men, and with the same man in different stages of development, one or two points should be tried, and that which shows the greatest girth selected.

Thigh.—The leg held as in the preceding measurement. The tape to be passed in a horizontal line round the thickest part of the limb, which will be at the highest point of the thigh admitting of horizontal measurement.

PLATE I.

STARTING POSITIONS.

1. *Position of attention.*—The body and head must be held erect. The *shoulders* square to the front; the *arms* hanging easily, with fingers close, slightly bent, and their tips touching the thigh behind the seam of the trousers. The *knees* must be well braced back, the *heels* closed and in line, the *toes* turned out at an angle of 45° , the *weight* of the body on the forepart of the feet. The *chin* must be drawn slightly in, and the *eyes* look straight to the front. Fig. 1.

2. *Feet close.*—Maintaining the rest of the body in the position of *attention*, raise the toes, and by pivoting on the heels close the feet. Fig. 2.

3. *Astride.*—Keeping the legs straight and the toes turned out, carry the left foot *two foot-lengths* direct to the left, keeping it turned out at the same angle as at *attention*, the weight of the body equally on both legs. Fig. 3.

4. *Left foot forward, place.*—Keeping the shoulders square to the front, carry the left foot *one foot-length* forward, keeping it turned out at the same angle as at *attention*, both feet flat on the ground, and the weight of the body equally on both feet. The *right* foot may be advanced in the same way. Fig. 4.

5. *Left foot forward, stretch.*—Advance the left foot *two foot-lengths* forward, the weight of the body equally on both feet. Fig. 5.

6. *Left lunge.*—This movement is carried out in three stages—(1) Hips firm (see Fig. 7). (2) Turn on the heels and point the left toe direct to the left, and the right toe to the front, the body, shoulders and head turned well round so that they are square to the left. (3) Keep the right foot flat on the ground, and the right leg straight; lunge out sharply with the left foot *three foot-lengths* in the direction in which the toe is pointing, left knee in line with the left toe and well bent; incline the body forward over the left knee, the back straight and in line with the right leg; head well up. Fig. 6.

7. *Hips firm.*—Raise both hands smartly and place them on the hips, with the thumbs behind and fingers closed in front, grasping the waist firmly, elbows drawn back in the same line as the shoulders. The chest must be well expanded. Fig. 7.

8. *Neck rest.*—Starting from the position of *attention*, and without altering the position of the body, smartly raise the hands behind the *neck* and place them behind the upper part of the neck, finger-tips just meeting, the elbows well back, the chest expanded, and the head held erect. Fig. 8.

9. *Arms upwards, stretch.*—From the position of arms, bend (Fig. 1, Pl. II.), smartly stretch the arms upwards to their fullest extent, the hands the width of the shoulders apart, palms inwards, fingers and thumbs straight and close together. Fig. 9.

PLATE II.

EXERCISE I.

1. *Attention.* Fig. 1, Plate I.

2. *Arms bend.*—Keeping the shoulders drawn well back and down, and the elbows close to the sides, quickly bend the forearms upwards, the fingers slightly bent and pointing to the shoulders, the knuckles turned outwards. Fig. 1.

3. *Arms sideways, stretch.*—Keep the body steady, and with the utmost strength shoot the arms out sideways in line with the shoulders, fingers and thumbs fully extended and close together, and palms downwards. Fig. 2.

4. *Arms striking.*—From the *arms sideways stretch* position, without moving the upper arms sharply bend the forearms till the hands are in front of the shoulders, but not touching them. Keep the forearms and upper arms horizontal, and the palms of the hands downwards (Fig. 3). Then smartly and strongly strike the forearm outwards and as far backwards as possible, without altering the position of the shoulders.

5. *Arms sideways, stretch.*

6. *Arms upwards, stretch.* Fig. 9, Plate I.

7. *Arms forwards, stretch.*—From the position of arms bend, stretch the arms smartly forwards, keeping them parallel, with the palms inwards and the fingers straight. Fig. 4.

PHYSICAL CULTURE—I.



1



2



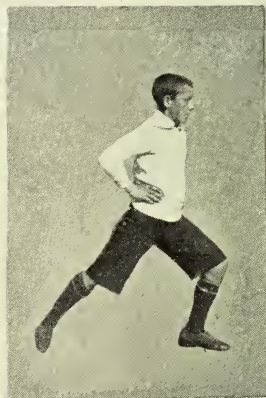
3



4



5



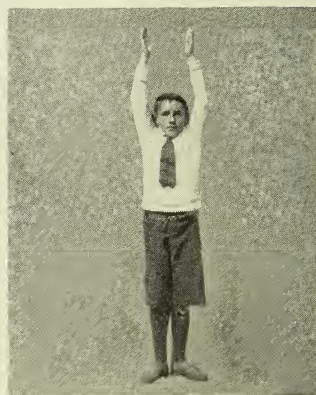
6



7

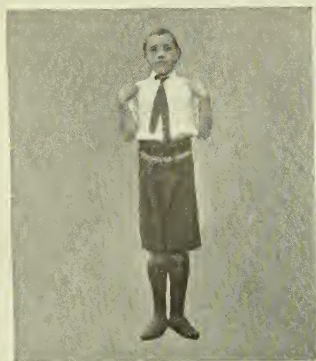


8



9

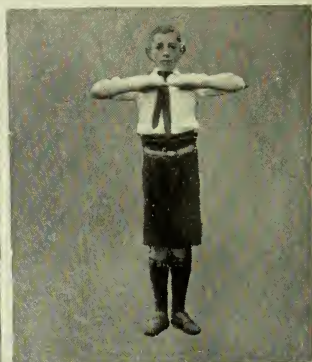
PHYSICAL CULTURE—II.



1



2



3



4



5



6



7



8



9

PHYSICAL CULTURE—III.



1



2



3



4



5



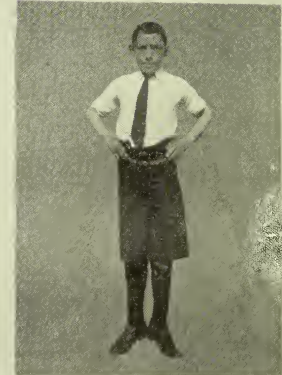
6



7



8

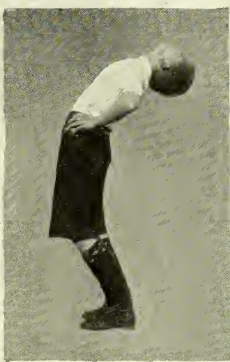


9

PHYSICAL CULTURE—IV.



1



2



3



4



5



6



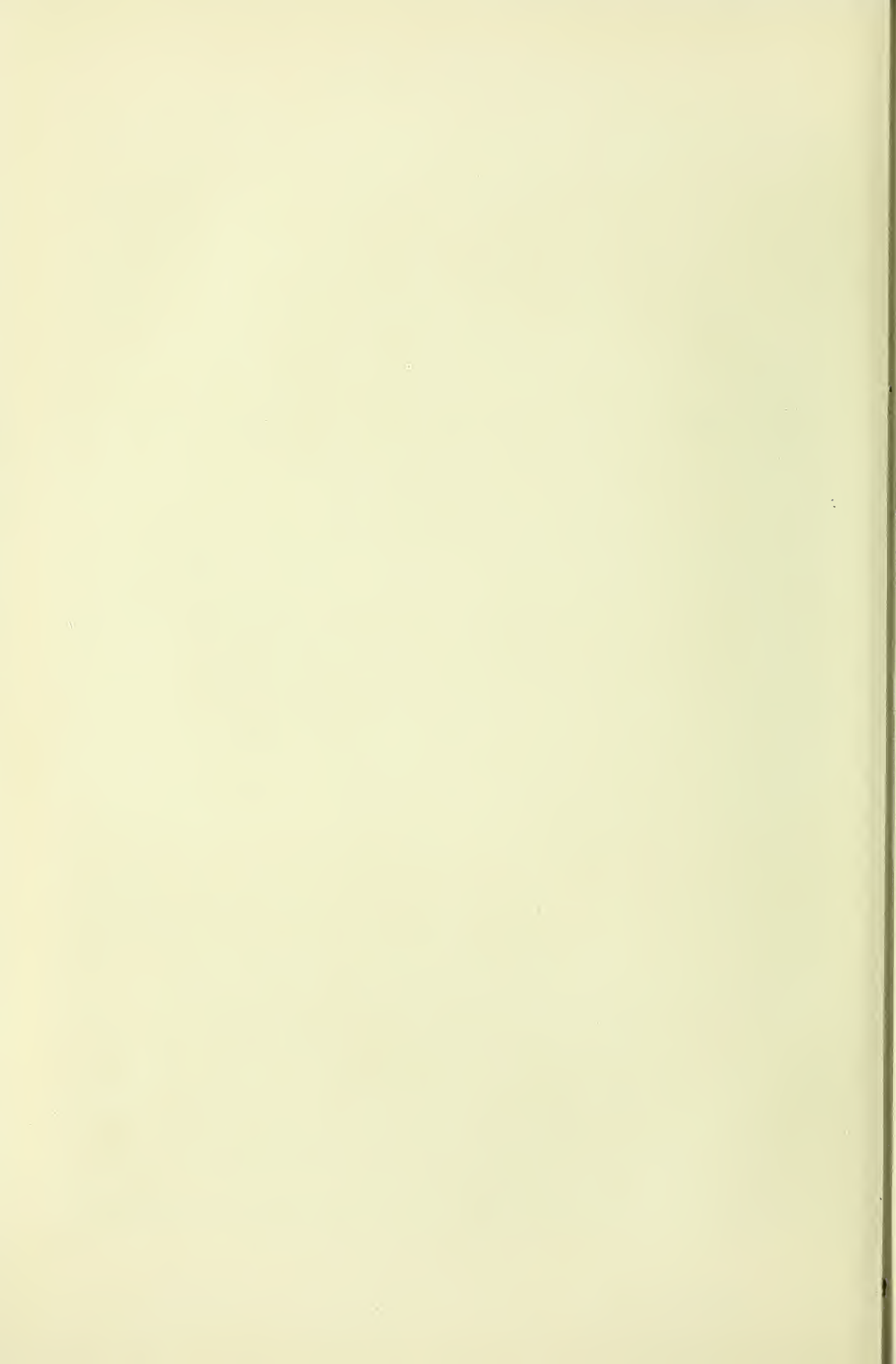
7



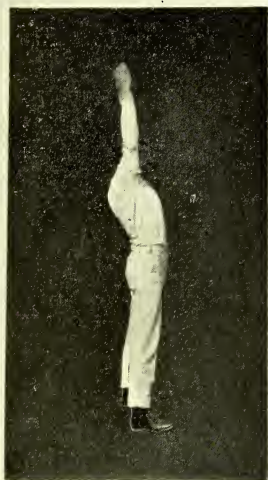
8



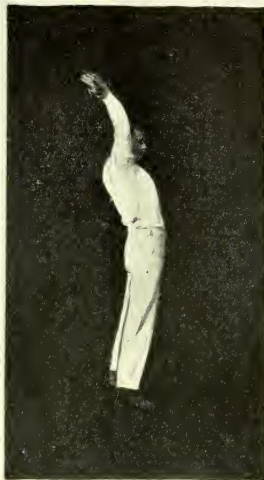
9



PHYSICAL CULTURE—V.



1



2



3



4



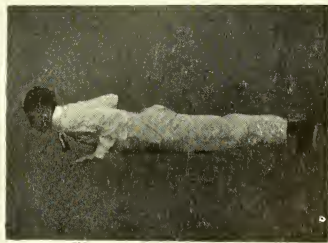
5



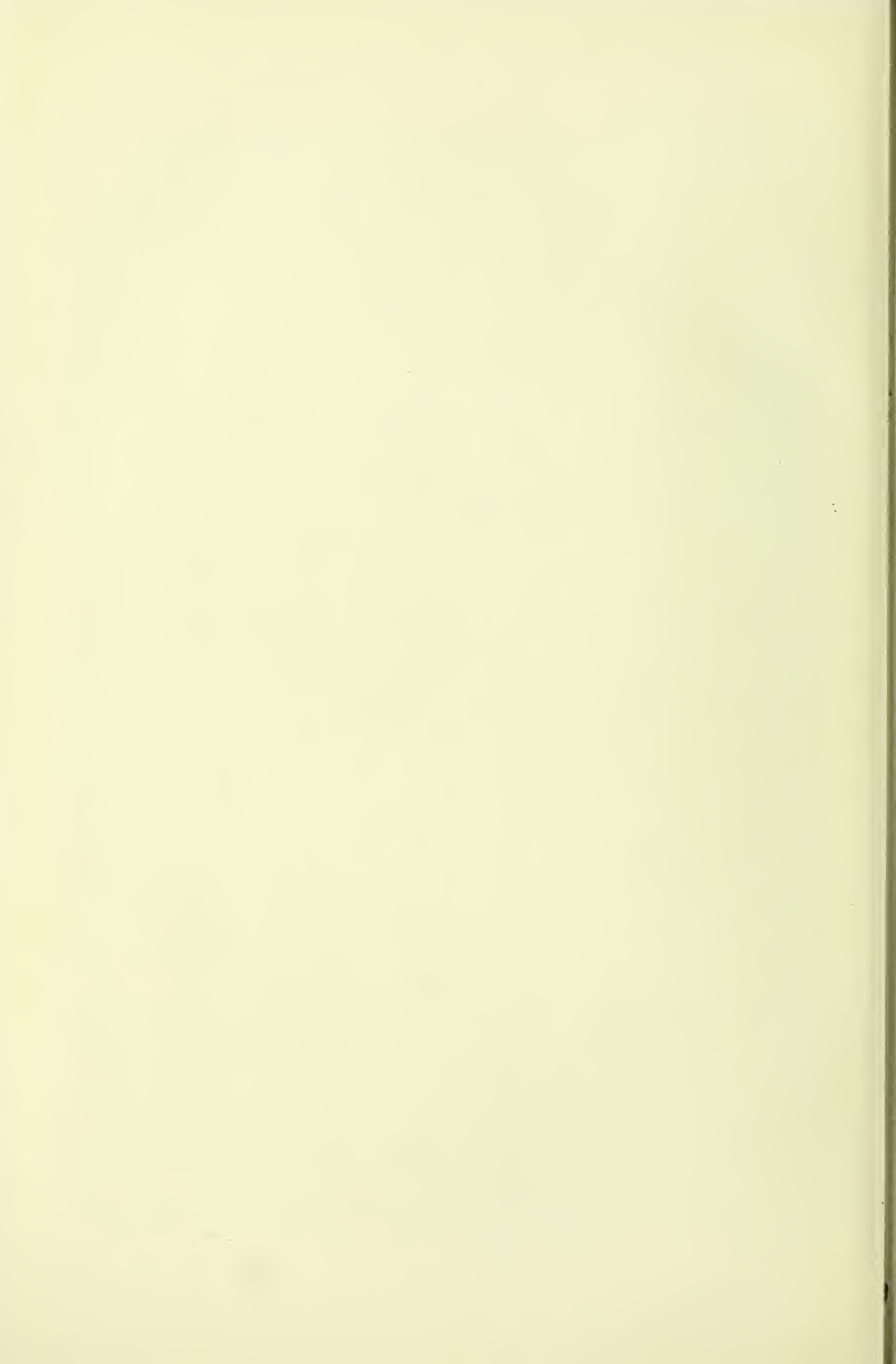
6



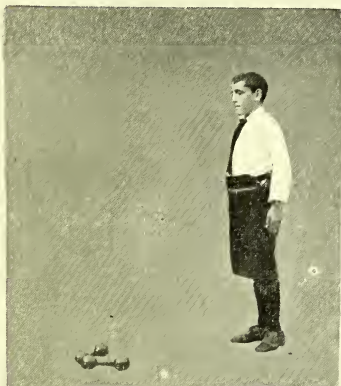
7



8



PHYSICAL CULTURE—VI.



1



2



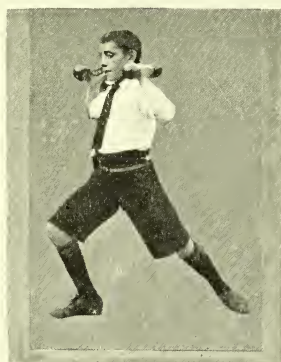
3



4



5



6



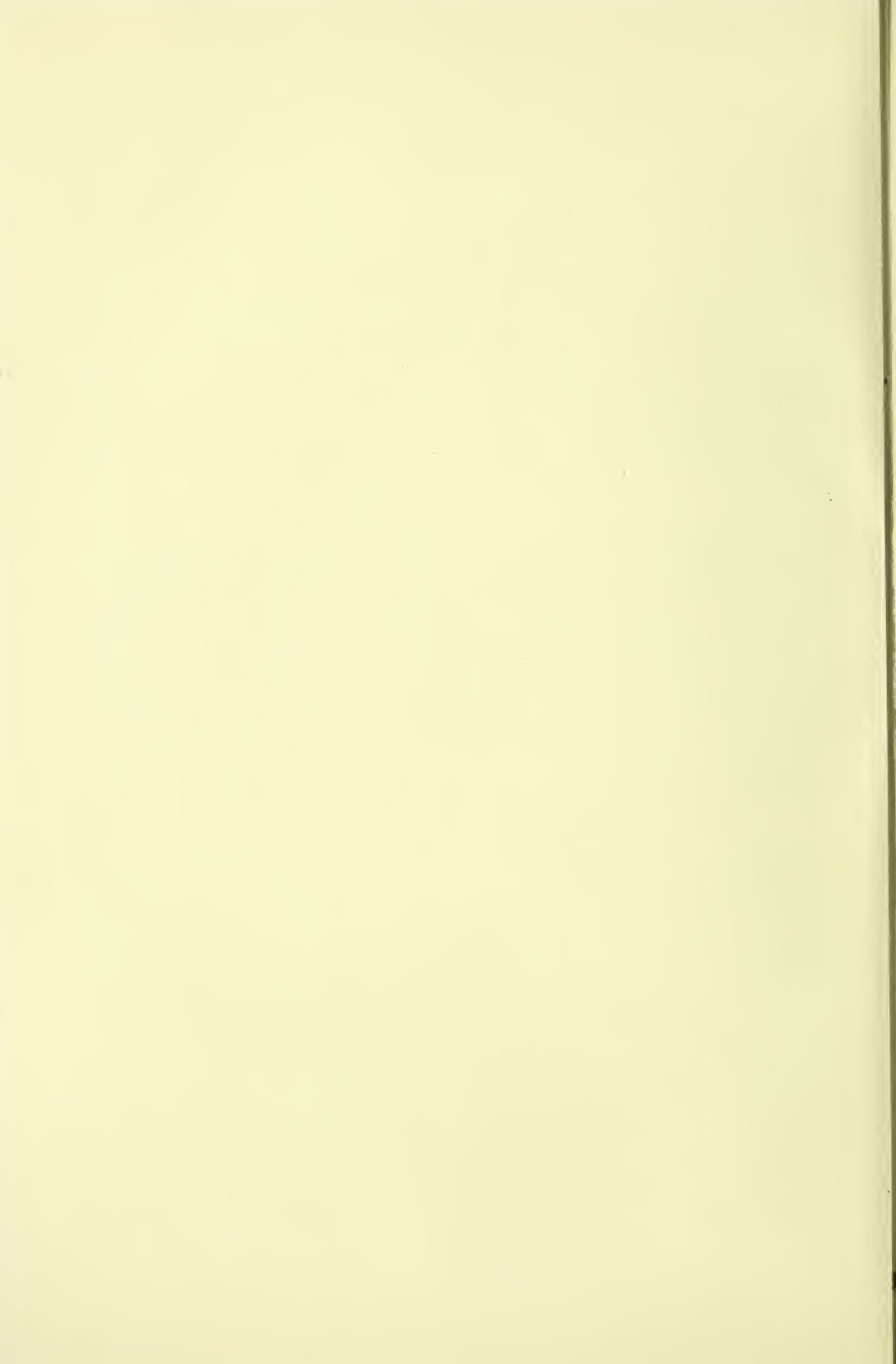
7



8



9



8. *Arms upwards, stretch. Trunk backward bending.*—From the first-mentioned position bend the trunk slowly backwards, the head commencing the movement, and the whole of the spine being arched. The feet must be planted firmly, and the knees kept straight. Fig. 5.

9. *Head and Trunk forwards, bend.*—Slowly recovering from the preceding position to that of arms upward stretch, bend the trunk slowly forwards, at the hips, keeping the knees straight, then continue the bending downwards, till the position depicted in Fig. 6 is attained. Finally, slowly resume the starting position of arms upwards stretch.

10. *Arms upwards, stretch. Left foot forward lunge.*—With the arms in the stretch position turn to the left and lunge the left forward three foot-lengths. Fig. 8.

11. *Arms upwards, stretch. Right foot forward lunge.*—Same movement as the last, substituting the right for the left foot, and turning to the right. Fig. 7.

Position, attention.—Resume the position of attention.

EXERCISE II.

1. *Arms bend. Heels raise. Knees bend.*—Bend the arms as in Fig. 1, Plate II. Then rise on the toes, and lastly, keeping the head and body erect, slowly lower the body until almost sitting on the heels. Fig. 9.

(This exercise is continued in the next plate.)

PLATE III.

2. *Heels raise. Knees bend. Arms upwards, stretch. Arms sideways, stretch.*—From the position depicted in Fig. 9, Plate II., stretch the arms *upwards*, Fig. 1, and then *sideways*, Fig. 2.

3. *Attention.*—Smartly spring up to position of attention.

EXERCISE III.

1. *Position. Astride. Neck rest.* Fig. 3.

2. *Trunk to the right.*—Turn the trunk slowly to the right, the head and shoulders being maintained in their relative positions. Fig. 4.

3. *Front.*—Slowly turn back again to the front.

4. *Trunk to the left, turn.*—Slowly turn the trunk to the left, Fig. 5, and again slowly resume the front position.

EXERCISE IV.

1. *Right leg backwards, stretch.*—Throw the weight of the body on to the left leg, and raise the right knee forward, until the thigh is at right angles to the body, then, keeping the body upright, carry the right knee backwards and stretch the right leg as far as possible to the rear, Fig. 6. Now raise the right knee slowly forwards again, and,

2. *Right leg forwards, stretch.*—Without moving the body, stretch the right leg forward, the toes pointed to the front. Fig. 7.

3. Slowly bend the knee again, having the thigh at right angles to the body.

4. *Change feet.*—Place the right foot on the ground, and raise the *left knee*, and exercise the left leg in the same manner as the right.

EXERCISE V.

1. *Attention.*

2. *Hips firm.* Fig. 8.

3. *Hips firm. Heels raise.*—Keeping the head and trunk erect, rise on the toes, bracing the knees back. Fig. 9.

4. *Heels, lower.*—Lower the heels to the ground.

PLATE IV.

5. *Hips firm. Heels raise. Knees bend.*—Keeping the body and head erect, slowly rise on the toes as high as possible, then slowly lower the body until almost sitting on the heels. Fig. 1, Plate IV.
6. *Stretch.*—Slowly straighten the legs, and stretch up as high as possible on the toes.
7. *Heels, lower.*—Slowly sink on the heels.

EXERCISE VI.

1. *Hips firm. Trunk backwards bend.*—Bend the upper part of the spine backwards as far as possible, keeping the head well back and the chest well forward. Fig. 2.
2. *Upwards stretch.*—Slowly straighten the body.
3. *Trunk forwards, bend.*—Keeping the back hollow, and the chest well out, bend slowly forward at the hips. Fig. 3.
4. *Upwards stretch.*—Slowly straighten the body.
5. *Hips firm. Trunk to the left, bend.*—Bend the trunk slowly to the left, without bending the right leg or raising the left foot. Fig. 4.
6. *Upwards stretch.*—Slowly raise the body to the upright position.
7. *Trunk to the right, bend.*—As in left bend. Fig. 5.
8. *Upwards stretch.*—Resume upright position.
9. *Hips firm. Left leg sideways, stretch.*—Raise the left leg sideways to the left, as high as possible, holding the body in the erect position. Fig. 6.
10. *Leg, lower.*—Lower the leg to the starting position.
11. *Hips firm. Right leg sideways, stretch.*—Repeat movement with right leg. Fig. 7.
12. *Leg, lower.*
13. *Attention.*

EXERCISE VII.

1. *On the back, down.*—Place both hands on the ground and lie down on the ground. Arms stretched behind the head. Feet together.
2. *Left leg, raise.*—Keeping the leg straight and the head down, raise the left leg slowly to the perpendicular position. Fig. 8.
3. *Left leg, lower.*—Lower the left leg slowly to the ground.
4. Repeat the movements with the right leg.
5. *Both legs, raise.*—Raise both legs to the perpendicular position. Fig. 9.
6. *Legs, lower.*—Slowly lower the legs.
7. *On the feet, up.*—Place both hands on the ground and spring to attention.

PLATE V.

EXERCISE VIII.

Span Bending.—In the series of illustrations given here, the head has not been thrown sufficiently far back. The movement of bending should always begin and end with the head. There are two classes of these exercises, one in which the *hands* grasp or are supported by some apparatus, and another in which the *back* is supported. Only the simplest of the first class of exercises is illustrated here, the hands being supported by a wall or door, and the exercise is begun by the individual standing with his back to the support and *one foot-length* distant from it; and taking up the position of—

1. *Astride. Arms upward and stretch.* Fig. 1.
2. *Backward, bend.*—Slowly bend the body backwards till the fingers are supported against the wall; palms towards each other, knees straight, eyes looking upwards. Fig. 2.

3. *Heels, raise.*—Raise the body slowly on the toes. Fig. 3.
4. *Heels, lower.*—Slowly lower the heels to the ground.
5. *Right leg, raise.*—The right leg is slowly raised straight forward without bending the knee, as near as possible to the horizontal position. Fig. 4.
6. *Right leg, raise. Knee bend.*—Having raised the leg as in the preceding position, bend the knee at right angles to the thigh. Fig. 5.
7. *Lower.*—Lower the right leg to the ground, and repeat the movements with the left leg.

EXERCISE IX.

ABDOMINAL EXERCISES.

1. *On the hands, down.*—Bend the knees and place the palms of the hands on the ground in front of the feet, and the width of the shoulders apart. Fig. 6.
2. Keeping the arms straight, shoot the legs to the rear, feet together, weight of body resting on palms of hands, and on toes. Fig. 7.
3. *Arms, bend.*—Keeping the body and legs in a straight line, bend the arms until the chest almost touches the ground. Fig. 8.
4. *Arms, stretch.*—Straighten the arms as in fig. 7.
5. *On the feet, up.*—Bring the feet up to the hands, assuming the position as in fig. 6.
6. *Attention.*—Spring to attention.

PLATE VI.

EXERCISE X.

DUMB-BELL EXERCISES.

1. *Attention.*—Stand as in Fig. 1. Facing the dumb-bells four foot-lengths from them.
2. *Right foot forward, lunge.*—Make a turn to the left, right toe pointing to the dumb-bells, and lunge forward with the right foot, and as the foot comes to the ground grasp the knee with the right hand, bend the back forwards and grasp the dumb-bell with the left hand. Fig. 2.
3. *Up.*—Maintaining the legs in the lunge position, raise the trunk to the erect position and raise the bell in the left hand to the level of the left shoulder. Fig. 3.
4. *Left arm upward, stretch.*—Forcibly extend the left upwards. Fig. 4.
5. *Lower.*—Replace the bell and return to the position of attention.
6. *Left foot forward, lunge.*—Repeat movement with left foot and right arm.
7. *Right foot forward, lunge. Both hands.* Fig. 5.
8. *Up.*—Raise both bells to level of shoulders. Fig. 6.
9. *Arms upwards, stretch.* Fig. 7.
10. *Lower.*
11. *Attention.*
12. Step up to the dumb-bells and assume the *astride* position, moving the left foot one foot-length to the left and the right foot one foot-length to the right, the bells lying between the feet.
13. *Down.*—Bend the trunk forwards and downwards and grasp the bells with both hands. Fig. 8.
14. *Up.*—Raise the body to the erect position and then bend it backwards, keeping the arms in the arm stretch position, and bending them as far backwards as possible. Fig. 9.
15. *Down.*—Swing the body forward again, replace the dumb-bells on the ground, resume the erect position, bring the feet together and stand at attention.

SECTION XI

MASSAGE, HYDROPATHY, AND ELECTRICAL TREATMENT

I. MASSAGE

Definition.—What is massage? There is a great deal of misconception in the minds of many people, in this country especially, as to the meaning of the term “massage.” Some imagine that massage is synonymous with rubbing, while others associate it with Turkish baths. Strictly speaking, the meaning of the term is “a scientific mode of treating certain forms of disease by scientific manipulation.” It is, in fact, a part of physical therapeutics. Since the movements which are used in this method of treatment are purely mechanical in their application, it follows that no extraordinary amount of skill or ability is necessary to enable any individual to acquire the art of performing them, and as the result of this a good many somewhat ignorant persons have either been employed to carry out the instructions of practitioners, or have themselves taken it upon them to practise massage. Consequently, the term has been subjected to a certain amount of utterly undeserved contempt. Properly understood, massage is a most useful and scientific treatment. All methods of application which neglect or ignore the special arrangements of muscles or nerves are not included in the proper use of the term “massage.”

The Movements in Massage.—For the due performance of the movements in massage it is necessary that the hands of the operator be highly sensitive, a quality which is partly innate in the individual and partly to be acquired only by long experience and practice. Some amount of bodily strength is necessary in the arms, and the hand itself should be neither too small nor too bony. There are four principal forms of application of massage movements, and these are known by the four French terms in common use in both that country and Germany. These four variations are (1) *Effleurage*, (2) *Massage à Friction*, (3) *Petrissage*, and (4) *Tapotement*.

(1) **Effleurage.**—The nature of this operation is a stroking movement, the pressure varying from moderate strength to the gentle stroking. It is not of very great use in itself, but is valuable when used in combination with the other movements to be noted immediately. Before performing, the skin of the patient having been

bared, it is anointed with vaseline or some such unguent, which renders the movements of the operator's hands more easy. Moreover, in those cases where considerable pressure is used, pain and irritation is thus reduced to a minimum. The object of effleurage is to promote the circulation of the fluids in the veins and the lymph vessels, and therefore it follows that the stroke is made towards the centre of the circulation, in other words, in the direction of the flow of the fluids in the tubes. Hence it is termed centripetal. The palm of the hand or both palms are used, and if the situation allows, the thumb is opposed to the fingers to increase the effect of promoting the flow. The movement is slow and gentle. The whole movement is thus described by Jacoby: "The surface of the ends of the fingers or of the entire hand having been applied to the part at a point situated more peripherally than the affected portion, is then pushed centripetally forward and a short distance beyond the part. When this hand has reached its destination, the other hand is placed at the starting-point, and the same movement executed. Meanwhile, the first hand has been brought back, so that by the time the second has fulfilled its purpose it is ready to begin again. This is then repeated with regularity. The time to be devoted to each stroke will vary much, the strokes also following with more or less rapidity." The manipulation of effleurage is used chiefly in cases of acute inflammation of joints, and in contusions or bruises. In very acute inflammations the movement is continued from thirty minutes to an hour at a time, and may be repeated several times during the day. It is obvious that the manipulation will begin with the most gentle pressure, and that this will be gradually increased as the patient becomes accustomed to it. Moreover, the pressure over the actually inflamed area will be less than that applied beyond it, gradually increasing as it is repeated.

(2) **Massage à Friction.**—This manipulation, like the first, is performed on the bare skin, which has been similarly prepared by the application of some unguent. The object of the movement is to break up any material which has been deposited by the process of inflammation, to make the tissues more vigorous, to stimulate the circulation, and in this way to enable all material which has been deposited in the affected part to be more easily removed by absorption. "It is performed by the hand, the first phalanges of the three middle fingers, or the point of the thumb. The applied part moves in circles, whose general direction is centripetal. Various degrees of pressure are employed, and the maximum is sometimes considerable." The term applied to this manipulation is not at all a good one, inasmuch as it has nothing to do with friction as we ordinarily understand

the word. It must be performed quickly and easily to be of any satisfaction.

(3) **Petrissage.**—This manipulation is again performed upon the bare skin, sometimes with a preparation beforehand with unguents, sometimes without any such preliminary treatment of the skin. "The part to be treated is taken up between the thumb on the one side and the tips of the four remaining fingers on the other, and a process of kneading, closely resembling nipping, is carried out. Both hands, however, are also employed, and the part kneaded between them with an even pressure." It consists essentially, that is, in picking up a part of a muscle or some other structure, in either one hand or both hands, and submitting this part to somewhat firm pressure, and along with the application of this pressure the part is rolled between the fingers and the parts which lie underneath. When both hands are used, they must be moved simultaneously and in opposite directions. As the thumb and fingers are wide apart, the whole muscle under treatment is pressed and rolled from below upwards, just as one would proceed to squeeze out the contents of a tube of paint. Care must be taken to see that the skin over the part moves along with the hands, or else some degree of pain will be inflicted upon the patient. The kind of condition in which this manipulation is employed is in such a case as an inflammatory swelling in a single muscle or in a group of muscles. Such a condition may occur in chronic or acute rheumatism, or in sciatica in the muscles near the sciatic nerve. It is also of use in restoring wasted muscles to their normal strength and function.

(4) **Tapotement.**—This is a manipulation applied to the bare skin, either directly by the hand, or indirectly by some mechanical means. It is in the nature of tapping or beating the surface. The hand is used in various positions. The two first fingers may be stretched over to the ball of the thumb and the beating given with the hand in that position. The hand may be made into a saucer shape, as if one were scooping up water in it, and applied so, or the tapping may be performed with the finger-tips. The object of this special operation is to act upon the nerves, and to restore their normal healthy action. It is used in this way for the relief of pain.

In all these methods, it should be stated, some authorities prefer to do without vaseline or any other kind of unguent whatsoever.

Who should Perform Massage?—The next matter to be considered is the selection of the operator, the masseur or masseuse, as the case may be. Obviously the choice will depend upon circumstances, but in all cases the duty should be entrusted only to well-

educated and trained persons, whose characters are vouched for. For women and children a female operator (*masseuse*) should always be engaged, and she must be a woman of refinement with sufficient knowledge of anatomy and physiology to enable her to carry out her duties intelligently. A good training in the methods is, of course, an essential. She (and he also in the case of the male operator) must be in good health and vigour, possess a ready tact and sympathetic bearing, a soft, pliant, but strong hand, a cheerful manner, and a thorough knowledge of the business to be undertaken.

The Period of Application.—The duration of the operation is a matter of great importance, upon which authorities differ. In most cases it need not occupy more than a quarter of an hour or even ten minutes at a time, and many think that even less is sufficient. In acute cases the process may be repeated several times daily, but in chronic conditions frequent sittings are not essential. As regards the time of day, the morning is perhaps the best, and the patient should where possible go to the operator rather than bring the operator to him; in this way the operator is saved fatigue—a very important matter. When the sitting is over, the patient should go about his ordinary avocations as soon as possible, presuming, of course, that the disease is not so acute as to confine him to bed.

Massage and Morals.—In view of the fact that in recent years some of the establishments which have been advertised as massage institutions have been eminently undesirable places, it is necessary to caution the public against persons styling themselves “rubbers” or “professors of massage,” and to insist upon massage being carried out under medical supervision and advice.

II. HYDROPATHY

Definition of Hydropathy.—In the widest sense of the word, hydropathy means the treatment of disease by means of water. It includes what is technically called *Balneology* (*balneum*, a bath), which is the science dealing with the nature and uses of the various forms of baths and mineral springs, so that it may be easily understood that the scope of the subject is extremely wide.

The use of heat in baths seems to have arisen with the Aryan race in the warm parts of Asia, though doubtless used by widely scattered nationalities. The hot-air bath is first found among the Greeks, the hot-air chamber of the Laodiceans being the primitive pattern. Hot baths came to be considered a luxury, and Xenophon insinuates that they are effeminate.

The Romans of the Republic used only cold baths, introducing the hot after their acquaintance with the Greeks. Finally, the state provided hot baths for the citizens at large, imposing upon the aediles the duty of attending to the regulation of the temperature. From the remains of these *Thermae*, as they were termed, we find that they were the most magnificent public baths on record. The Romans carried their customs wherever they went, the baths as well as others, and frequently, as at Bath in England, they erected them in the neighbourhood of hot springs.

The Action of Water—Internal.—The effect of drinking *cold* water is to lower the temperature for a time, and also to reduce the rate of the beating of the heart. The larger the amount and the more quickly it is swallowed the more pronounced are these results. *Warm* water when drunk has the opposite effect. It slightly increases the heart's frequency of action as noted by the rate of the pulse. Curiously enough, *hot* water, by which is meant water at a temperature of 110° to 115° F., has much the same action on the heart as cold, but it raises somewhat the general body temperature.

The Action of Water—External.—The results of the external application of any form of water depend fundamentally upon the physiological action of the skin, and the connection between the skin and other parts of the body. The skin is one of the means by which the body temperature is regulated. It prevents the body heat from being too easily lost by contact with the outside air. Nine-tenths of the heat we lose from our bodies passes from us by one or other of the skin functions. This loss at any given time depends upon the degree in which the skin is hotter than the surroundings. The warmer the skin the greater the loss of heat, and *vice versâ*, the cooler the skin the less is the loss of body heat. This varying loss of heat from the skin is regulated by a very delicate nervous mechanism, and is constantly being adjusted to the different circumstances in which the body finds itself. But it is also to be remembered that in addition to this heat-regulation function, the skin also is an organ of excretion by means of its glands, and thirdly, that it is chiefly by means of the skin that we receive the great number of impressions which bring us into relation with the world around us. By means of the marvellously intricate network of nerves which is spread over the whole skin surface the different forms of sensation are conducted to the brain. So that the effects of the application of any form of water treatment to the external skin are to be found in their action upon these three great duties which it is the business of the healthy skin to perform.

The Effects of External Heat.—The effect on the body heat

depends on the temperature of the water applied. There is no change in the loss or production of body heat if the temperature is about that of the body itself, say water at 93° to 95° F. At lower temperatures baths cause a loss of heat, the exact amount depending upon their coolness, but sometimes this loss is very considerable. But along with this loss of body heat, there is an increased production of heat in the body, an increase which in the case of a cold bath may be three times the normal. Cold baths, therefore, do not lower the temperature *in health*, unless they are unduly prolonged. Baths taken at a temperature above 98° F. (body temperature) cause the heat to accumulate in the body, by preventing the usual loss, and if this loss be absolutely stopped the body temperature may rise as much as 4° F. in half-an-hour.

As far as the tissues are concerned, it is believed that cold applications tend to increase the amount of fat produced in the body, while hot baths cause the glands in the skin to act more freely, in proportion to the degree of heat. So in a hot bath the perspiration is increased and a corresponding amount of weight lost. Next the effect on the circulation is to be noted. Cold applications cause the small blood-vessels of the skin to contract, which drives the blood into the deeper vessels, the result of which is seen in an increased pulse rate at first, but which afterwards becomes slower. In warmer baths quite a different effect is attained, and these baths have a great value in certain diseases of the circulatory system. Heat is withdrawn to some degree, blood is attracted to cold hands and feet, and the general effect is soothing and sedative. Very hot baths cause distension of the skin vessels, quicken the pulse, and may produce considerable enervation and weakness for some hours. This effect is prevented by taking a cold bath after the very hot one, a constant habit in Russia.

Lastly in this connection, the influence of different temperature of applications of water on the nervous system is to be noted. In cold baths, the sensation of coldness stimulates the increased production of heat. Baths just a little warmer than the skin give rise to a general sense of warmth, and this is for the majority of people the most pleasurable degree of heat. Baths of a temperature above blood heat stimulate the nerve centres in the brain at first, and may even produce a feverish state with great prostration. These effects are prevented by carefully avoiding too long immersion, or by following the hot bath with a cold one.

The Application of Water—Internally—Drinking Warm or Hot Water.—The drinking of hot water (110° to 115° F.) is a very useful aid to the action of the stomach, and to wash out the

system generally. The best time to take it is early in the morning, or one hour before the midday or evening meal. Gouty patients occasionally find considerable relief from drinking a glass of hot water at bedtime. In some people a sensation of nausea or sickness follows upon drinking hot water, but this can be obviated by making the water hotter, it is *warm* water which is sickening. The addition of some lemon juice will also prevent the unpleasant sensation. As regards the dose, it is usual to commence with from four to six ounces. In some cases, for instance in gout, as much as a pint may be taken every morning, the patient taking some quarter of an hour or so over the drink.

The Internal Use of Mineral Waters.—Perhaps the most important use of mineral waters internally is to be found in the laxative powers possessed by many of them, together with the soothing and sedative effect upon the stomach of those which contain carbonic acid gas. Others correct over-acidity in the stomach, help to increase the action of the kidneys, improve the quality of the blood, and act generally as tonics. It must always be remembered, however, that patients who undergo a course of “drinking the waters” at the special establishments provided for that purpose, have at the same time the advantage of the change of air and scene, and, not least, a strictly regulated diet. It is not always easy to determine how much of the improvement is due to the one and how much to the other. In addition, baths are generally combined with the internal administration, so that many factors contribute to the “cure.” The cases which are most benefited will be noted when we deal with the baths, being, generally speaking, of a dyspeptic, gouty, or rheumatic nature.

SUMMARY OF MINERAL WATERS

For convenience of reference, the following summary of the most important mineral waters and their uses may be appended:—

Aperient Waters.

Aesculap	Franz-Josef	Hunyadi-Janos	Seidlitz
Apenta	Friedrichshall	Leamington Spa	Villacabras.

These are used in habitual constipation, chronic dyspepsia, piles, and other similar conditions.

Alkaline Waters.

Aix-la-Chapelle	Malvern	Vichy	Ems
Contrexeville	Chantilly	Bethesda	Kissengen, &c.

There are very many others besides the above, all of which are used in disturbance of the digestive apparatus, especially over-acidity and chronic Bright's disease.

Ferruginous or Iron Waters.

Homburg

Marienbad

Nauheim

St. Moritz, &c.

These are used in all forms of weakness associated with anæmia.

Table Waters.

Aix-la-Chapelle
Malvern

Apollinaris
Pitkeathly

Chantilly
Roman Spa

Johannis
Selters

Victoria, &c.

These are mostly alkaline and gaseous, very dilute, taken *ad lib.*, at meals or between meals, either alone or mixed with wine or spirits. They are valuable in impaired digestion.

The External Uses of Water—Ordinary.—Ordinary cold or hot water is used externally in hydropathy in two main forms: first, in one or other variety of bath; and second, in one or other form of “the pack.” In addition to the usual morning splash or tub, there are a number of special forms of the cold or hot bath, amongst which the following may be enumerated:—

The Shower Bath, which lasts for one or two minutes, the temperature used varying from 50° to 100° F.

The Needle Bath, which consists of two curved pipes connected by a number of vertical pipes perforated with apertures at intervals of an inch and a half, by means of which a number of jets of water of some force strike the whole body surface at the same time. Douches, in which the temperature varies from 50° to 100° F., applied from a half to two minutes, in which a stream of water is played on the patient from a nozzle.

The Pack.—A water pack may be applied to the whole body or to a part only, and it may be either hot or cold. Dr. W. Armstrong, of Buxton, thus describes the hot pack: “A thick blanket is folded and rolled up in bottle form. Boiling water is poured through the two ends in turn: it is covered with a large hot towel, and as much superfluous moisture as possible wrung out. It is then spread out on the top of two large dry blankets spread on the bed; on a spare one, if the patient is confined to bed. The patient, divested of clothing, is placed on the hot wet blanket and rapidly covered up by this and the dry ones. Hot water tins should be placed outside the blankets and to the feet, and cold water cloths to the head. The operation should be done quickly, so that the wet blanket does not lose heat. Duration, thirty to sixty minutes.” Perspiration with a consequent fall of temperature results.

Cold Pack.—The same authority gives the following directions for applying the cold pack: “Two large thick towels are wrung out of tepid or cold water. The patient is laid on one and covered by

the other, and a single blanket is lightly laid over all. Every ten or fifteen minutes the upper towel should be replaced by one wrung out of cold water; the lower one may be changed every hour if required. Duration, from thirty minutes to two hours." In this way a rapid loss of heat from the body is brought about, evidenced by a fall in temperature.

When to Use the Various Applications.—The various procedures above described are of the very greatest service in many acute diseases, especially severe fevers, in which the temperature of the patient rises to such a degree as to threaten a fatal issue. In acute rheumatism or rheumatic fever, a hot blanket pack, as above described, may be repeated twice daily if required. Dr. Armstrong, however, recommends that in the very high temperature of rheumatic fever, cases which are apt to terminate fatally so quickly, the cold bath should be used *immediately*. He is of opinion that in these cases the time lost in cold sponging or cold packing has been responsible for the loss of many a life. The cold bath in these cases should last from ten to thirty minutes, it should be placed close to the bed, and the patient carefully lifted by five people who hold the corners of a sheet on which the patient lies, one person supporting the patient's head. The water should be at a temperature of 92°, and should be rapidly cooled by the adding of ice or cold water, till it reaches 72° F. The patient should be kept in until his temperature falls to below 100° F. Attention must be paid to the condition of the heart, and after the bath the patient is carefully lifted back to bed in the sheet, a hot blanket being put underneath him, and hot bottles to the feet. Sheet and blanket are withdrawn in a short time. The bath should be repeated as often as the temperature reaches a height of 105° F.

In those cases of scarlet fever or scarlatina where the rash does not come out well, and the temperature threatens to cause death, the treatment advised is precisely the same as that just described for acute rheumatism.

The External Use of Mineral Waters—Peat and Mud Baths.—The principal baths of this sort are those of Marienbad in Bohemia, Pyrmont, &c. in Germany, and Strathpeffer in Scotland. The peat baths contain some iron and acids. They are prescribed in sluggish action of the skin, neuralgia, and chronic rheumatic affections. The mineral mud baths of the many various Spas contain iron, or sulphur, or arsenic, and are used in rheumatism.

Vapour Baths.—These are mainly employed to remove concretions around joints, and in inflammatory affections. Among the Spas where this treatment is carried out may be mentioned Bath, Aix-la-Chapelle, and Baden.

Brine Baths.—These contain much salt, and are used in muscular rheumatism, sciatica, and chronic joint affections. Droitwich may be taken as a characteristic example. (Nantwich, Woodhall Spa, Cheltenham.)

Marine Baths.—These are beneficial in anæmia, asthma, chronic catarrh, and scrofulous conditions. They should not be taken in eczema, erysipelas, or phthisis, nor in bilious dyspepsia.

Gaseous Baths.—These waters, as at Nauheim, contain free carbonic acid gas in sufficient quantity to affect the skin. They are used chiefly in heart conditions.

Sulphur Baths.—Pure waters of this kind, as found at Strathpeffer, are used for eczema, rheumatism, gout, and skin affections. At Aix-la-Chapelle they are used for syphilis. (Harrogate, Mandrinodod, &c.)

General Rules to be Observed.—Before any course of treatment be determined upon, the following points should be carefully attended to:—

- (a) The heart should be examined.
- (b) No extreme temperatures should be used for children or very aged patients.
- (c) No mineral baths should be given during menstruation.
- (d) The effect of each bath should be watched.
- (e) The duration of the bath must be carefully regulated.
- (f) Mineral baths should never be employed in febrile states.
- (g) Physical exercise must be attended to along with baths.
- (h) After a course of treatment, a week or two should be spent among the hills or at the seaside; rest, together with a bracing change.

III. ELECTRICITY IN MEDICINE AND SURGERY

Forms of Electricity.—The phenomenon of electricity shows itself in two ways, one of which is termed “static,” the other “dynamic.” Static electricity is seen in many experiments on a small scale, for example, when ebonite is briskly rubbed with silk or flannel. It is the same kind of electricity as is seen in a flash of lightning. Dynamic electricity, on the other hand, which is the form used in medical appliances, is produced in batteries and induction coils. The electric current obtained from a battery is called a galvanic, continuous, or constant current. That which is produced by means of a battery and an induction coil is called a faradic or interrupted current. A galvanic current is produced by the chemical action which takes

place between two metallic plates of different constitution. If two plates, one of copper and the other of zinc, are placed in a weak acid solution and connected by a wire, it is observed that bubbles of gas collect on the copper plate, and it can be proved that a current passes along the wire. The whole arrangement is a galvanic cell, and a number of these connected together would form a battery. The parts to which the wires are attached are called the "poles" of the battery, the metal plates being termed the "elements." "The zinc is termed the positive element but negative pole, the copper the negative element and positive pole. The current flows always from the positive to the negative, that is, from the zinc to the copper within the liquid, and from the copper to the zinc without." In using batteries of this kind, the great thing to secure is a current of constant strength, and an arrangement of cells which is easily kept in order.

The interrupted or faradic current is made by means of a single cell, as above described, and a medical induction coil. This latter implement depends upon the discovery that when a wire conveying the first or primary current of a galvanic cell is brought near, but not in contact with another wire, a fresh or secondary current is set up in the second wire, which runs in an opposite direction to the first one. A medical induction coil consists simply of these primary and secondary coils. The primary coil is just a few spirals of thick copper wire connected to the cell. The secondary coil is a very fine copper wire of many spirals, which is wound round the primary coil but not connected with it. The current is "induced" in it, simply by the second wire being near the first. Various mechanical contrivances are introduced for starting, stopping, reversing, &c., the current.

The difference between the two kinds of electricity is that the induced current is momentary in its action, not continuous. Its direction too changes from time to time, it causes muscles to contract more readily than the constant current, and it does not affect the special nerves of sense as does the constant current. Moreover, the great action in the continuous current takes place at the moment the current is made or broken. In applied electricity the effects are correspondingly different.

Thus the repeated interruptions of an induced current soon tire out a muscle by repeated contractions and induce fatigue. On the other hand the galvanic current with its continuous uninterrupted current has a refreshing effect.

How the Currents are applied.—The currents are applied by conducting wires from the battery which end in various kinds of special appliances adapted to the particular part of the body to be operated upon. Some end in sponges with a special holder. The

terminations of the wires and their appliances are the "electrodes." The application may be "general" when the current is passed through the whole body, or "local" when it is sought to influence special muscles or groups of muscles, nerves, or organs.

The Uses of Electricity.—The medical use of electricity is directed to two ends; first, to ascertain certain facts which help the physician to make a correct diagnosis and forecast of the course of the disease, and second, as an aid in the recovery of his patient. With the former we have nothing to do, it is a matter for the skilled physician. We may simply say that by suitable tests the physician is able to say whether the disease is in the central nervous system, or in the more terminal parts of the nerves themselves.

Conditions in which Electricity is used.—(a) *Paralysis.*—In cases of paralysis the electric current is used to keep the paralysed muscles as healthy as possible, so that should the brain once more send its usual messages to the muscles they will react as they would in health. (b) *Painful affections.*—In cases of painful neuralgias, the galvanic current is found to exert a good influence, as it also does in neuralgic headaches, lumbago, sciatica, and some painful rheumatic conditions. (c) *Muscular wasting.*—It is found in some injuries of nerves, inflammation of nerves, or spinal disease, in which the muscles are wasting away, that galvanism is of service. (d) *Tumours of the womb.*—In 1882 the method of treating certain tumours (uterine fibroids) by electricity was introduced as a substitute for operating. It is claimed that the tumour diminishes in size, and that bleeding is stopped as well as discomfort relieved.

Electrolysis.—By this term is meant the breaking up of a substance into simpler elements by causing a current of electricity to pass through it. It is used in the following conditions: (a) *In the treatment of those curious congenital marks (naevi) known as mother's marks, or port wine stains,* which are really tumours composed of numbers of blood-vessels. The advantage of this method of treatment is that it leaves no unsightly scar, so long as the "mark" is under the skin. Other forms of blood-vessel diseases are equally suitable for treatment by electrolysis; for example, some aneurisms, or local dilatations of arteries. The object here is to induce the blood in the vessel to clot. Some of these cases are in situations where an operation is out of the question and electrical methods the only hope. (b) *Electrolysis* has been used with good results but not without anxiety in the disease known as "goitre." The diseased tissue is destroyed and absorbed. (c) As a *depilatory*, electrolysis is a very successful method of removing superfluous hair; hair in places where it is neither useful nor ornamental, and this is one of the most satis-

factory of its applications in practical treatment. An electrical needle is thrust into the bottom of each hair follicle, and the inflammation thus set up obliterates the hair follicle completely.

Finally, it has to be remarked that the greatest care should be exercised in the application of electricity in medicine, and every battery to be used should be carefully tested as to its strength and constancy before being applied. If this be not done, accidents may happen which a little forethought will prevent.

SECTION XII

COOKING FOR INVALIDS AND DYSPEPTICS

INTRODUCTION

IN many cases invalids are more dependent upon food than upon medicine, and therefore no care is too great to bestow upon the preparation and securing of appropriate and appetising dishes. The nurse who would be successful in this important and useful branch of her art must grudge no trouble, must be exquisitely clean, and punctual to a minute. She must also have a sense of proportion to enable her to serve inviting portions with due regard to the nourishment each contains. Cleanliness in cookery implies the perfect freshness of every ingredient used, and is absolutely necessary. Not only is the digestion of an invalid in most cases more easily impaired than that of one in robust health, but the palate is more sensitive and detects the slightest trace of taint with surprising acuteness. It is therefore a safe rule to make nothing in too large quantities. At the same time something must always be in readiness, as an invalid should never suffer from exhaustion incurred by waiting for food. To a convalescent meals are often among the few events of the day, and variety should be studied as far as possible. Even when only a restricted diet is permissible, a little difference in the manner of serving may help to tempt the invalid's appetite. No food should be cooked or prepared in the invalid's presence when avoidable. Untouched food should never be left in an invalid's room, but put aside in a cool place. If serving the same portion a second time, let it be in a different form. Patients should not as a rule be consulted about their meals, but a nurse should tactfully try to discover their likes and dislikes, and exercise some forethought to see that these are provided for. All dishes, spoons, &c., for an invalid's use, should be scrupulously clean and bright, and arranged neatly on a tray with a spotless tray-cloth, and when obtainable a few flowers. Every such little attention helps to brighten an invalid's life, and often tempts a feeble appetite.

The beef used for beef tea must be freshly killed, lean, and juicy. Beef from the buttock, rump, or thick flank may be used. Shin of beef is not suitable, as it contains too much bone and gristle, which produces gelatine, a substance of little value to an invalid. There are many different recipes given for the making of beef tea, but whatever plan is adopted, the object must be to extract as much goodness from the meat as possible, and to present this in its most digestible form. Beef tea must never boil, but only simmer very slowly. The reason of this is that the albumen of meat, which is like the white of egg, if cooked at too high a temperature, becomes hard and indigestible. Beef tea is not a

nourishing food, but rather a stimulant, so, whenever possible, it should be given with, or alternately with, other food. In the following recipes very little, if any, vegetable flavouring is used. In the invalid state vegetables are often prohibited, and even salt has sometimes to be withheld. If allowed, they can, of course, easily be added. Those soups without thickening of any kind, such as flour, tapioca, or yolks of eggs, are always considered the most digestible. Most soups, except beef tea, are better made the day before they are wanted, as they have then time to cool, and the fat can more easily be removed from the top of them. Never allow soup to cool in the saucepan in which it has been made, but always pour it into a basin. Soups for invalids must always be made from fresh meat. The bones and meat may be put on a second time with cold water to cover them, boiled for several hours and then strained. This second stock will do very well for any ordinary household purposes, but is not good for an invalid. In serving soup to an invalid do not fill the cup or basin too full, and on no account let any be spilt in the saucer. Also be most particular to see that there is no grease on the top of the soup. If the first mouthful of soup an invalid takes is greasy, it is quite sufficient to prevent more being taken. A neat piece of plain bread, a piece of well-made toast cut into thin strips, or a rusk, as preferred, may be served with it.

1.—BEEF TEA.

Proportions—

1 lb. lean, juicy beef.	1 teaspoonful of salt.
1 pint cold water.	

Method.—Wipe the meat with a damp cloth to make sure of its being quite clean. This is very important, as you do not know whose hands may have touched it. Then place on a board and with a sharp knife scrape or shred down as finely as possible, as the more finely it is shredded the more juice you will extract. Keep back any pieces of fat and skin. Then weigh and put into a strong jar or basin, add the salt and cold water, and stir well up with a fork. Cover with a double piece of white paper, greased and tied down. The grease on the paper makes it non-porous and prevents the strength of the beef tea escaping. Instead of the paper a paste of flour and water may be used, rolled out and twisted over the jar. Nottingham jars, which are made of strong ware, with tight-fitting lids, are excellent for beef tea, or best of all is a regular beef tea extractor (Dolby's patent), which is a double case; the outer one tin, with a lid which screws on, and legs which raise it above the foot of the pan. The

inner case is of white porcelain, into which the beef tea is put. Cooked in this the beef tea cannot boil; the steam is kept well in, and the strength thus preserved. Allow the beef tea to stand for half-an-hour at least before cooking. The cold water will help to draw out the juice. A few drops of hydrochloric acid are sometimes added to assist the process, but it must be used with the greatest care. Occasionally a little claret, port wine, or lemon juice is used. After the beef tea has stood for the required time, stir it again, and place the jar or basin containing it in a saucepan, with sufficient cold water to reach half or three-quarters way up the basin. Put the lid on the pan, and boil slowly for three hours. During this time see that the water does not boil down too low in the pan, but if it should, add more cold water. If making a larger quantity than the above, more time must be allowed in proportion, and it will be a good plan to lift out the jar once or twice during the time, remove the cover, and stir the beef tea well, as the meat is apt to get hardened into a cake, and it is then difficult for the juice to be drawn from it. When cooked sufficiently, remove the jar from the saucepan, stir up the beef tea, strain through a coarse strainer, and press the meat as dry as possible with a wooden spoon. Remove all grease from the top of the beef tea by passing over the top of it pieces of soft white paper. Be careful to have every particle removed, and it is then ready for serving.

Note.—Instead of steaming the beef tea, the jar containing it may be placed in a slow oven, when four hours instead of three must be allowed. Beef tea cooked in this way is very savoury in taste—often too much so for a delicate palate. In some cases clear beef tea is ordered, the small particles of beef being too heavy for the patient's digestion. In this case strain through a hair sieve or piece of muslin. Salt is sometimes not allowed.

Time—3 hours. **Probable cost**, 1s. 2d.

2.—QUICKLY-MADE BEEF TEA.

Proportions—

1 lb. lean, juicy beef. | 1 small teaspoonful salt.
1 pint cold water.

Method.—Prepare the meat in the same way as in previous recipe. Put it into a basin with the salt and water, stir it well up, cover the basin with a plate, and, if time permits, let it stand for half-an-hour. In this way the juice is well drawn from the meat before the beef tea is put on to cook. Then pour all the contents of the basin into a clean lined saucepan, place the pan over rather a slow fire, and, with two forks placed back to back, whisk it well until it almost reaches boiling point. Then draw the pan to the side of the fire, put on the lid, and allow the beef tea to simmer as slowly as possible from ten to twelve minutes. Strain and remove the fat from the top in the same way as for ordinary beef tea. This method of making beef tea does not extract so much goodness from the meat as that cooked in a jar for a longer time, but some people prefer it made in this way, and when it is required hurriedly this plan must be adopted. The greatest care must be taken that it does not boil.

Time—about $\frac{3}{4}$ hour. **Probable cost**, 1s. 2d.

3.—RAW BEEF TEA.

Proportions—

$\frac{1}{2}$ lb. lean, juicy beef. | A pinch of salt.
 $\frac{1}{2}$ pint cold water.

Method.—Prepare the beef in the same way as recipe No. 1. Put into a cup or basin with the water, and salt if it is allowed. Stir well with a fork, cover over with a plate, and let it stand from $\frac{1}{2}$ hour

to 1 hour, stirring occasionally. When the liquid is quite a bright red colour, strain through a fine strainer, pressing the meat well with the back of a wooden spoon. Serve this in a coloured glass or cup, as its appearance is decidedly objectionable. Only make as much as will be required at one time. It must on no account be kept for any length of time, as it very soon becomes rancid.

Time— $\frac{1}{2}$ hour to 1 hour. **Probable cost**, 4d.

4.—BEEF PUREE.

Proportions—

$\frac{1}{2}$ pint made beef tea | $\frac{1}{4}$ lb. lean, juicy beef.

Method.—Have the beef tea made in the ordinary way, strain it, remove all grease from the top, and keep it warm in a saucepan. Wipe the $\frac{1}{4}$ lb. meat with a damp cloth, then shred it down very finely. Pound it well in a mortar, and rub it through a fine wire sieve. Put this into a cup or basin, pour the hot beef tea on to it, stir it well up, and serve at once.

Probable cost, 10d.

5.—CHICKEN BROTH.

Ingredients—

1 chicken. | 2 or 3 pints of cold
1 dessertspoonful rice, | water.
or crushed tapioca, | 1 dessertspoonful of
or arrowroot. | chopped parsley.

Method.—Draw and singe the chicken, and make it very clean. The inferior parts will do quite well for making the broth. The breast may be cut off and reserved for some other dish. Cut the rest of the chicken into joints first, then cut all the meat from the bones into small pieces. Chop the bones, and wash any part which does not look very clean. Keep back any pieces of soft fat, but use the skin. Wash the neck well, and let it soak in cold water and salt for some time, to draw the blood from it. Open the gizzard, and remove the bag of stones from the inside, then wash it well, pulling off all the fat skin from the outside. Remove the gall bag very carefully from the liver, cutting it away with a pair of scissors, and wash the liver well. Also wash the heart, and scald the feet by letting them soak in boiling water for a short time, and then scrape them well. Take a clean lined saucepan—a deep one is best—and put into it the meat, bones, skin, neck, liver, gizzard, heart, and feet. Add the salt and enough cold water to well cover all. The quantity of water depends upon the size of the fowl used. Put the lid on the pan, and bring this slowly to the boil, then skim several times until the broth looks quite clear. Allow the broth to simmer slowly from 4 to 5 hours, until all the goodness is extracted from the meat, bones, &c.; skimming when necessary. Then strain through a fine strainer or hair sieve, and let it stand till cold. Then remove all the fat from the top, return the broth to a saucepan, and thicken according to taste. If rice is used, wash it well, and cook it in the broth until quite tender. If tapioca, bring the broth to the boil, sprinkle in the tapioca, and cook for about 10 minutes, until quite clear. If arrowroot, break it first with a little cold water, then add it to the broth when it is warm, stir until boiling, and boil for 10 minutes. A little very finely chopped parsley may be added at the end if liked, and more seasoning if required. If small pieces of chicken are liked served in the soup, the best plan is to lift some of the best pieces out of the broth as soon as they are cooked, but before all the goodness is lost, and reserve these for returning to the broth just before serving. If the broth is wished more savoury, cook small pieces of vegetable along with it. A more economical broth can be made by using a piece of mutton or veal along

with the chicken. Half the chicken only might be used, and the other half roasted to serve as a meat course.

Time—4 to 5 hours. Probable cost, 3s.

6.—RESTORATIVE SOUP.

Ingredients—

1 lb. neck or knuckle of veal.	3½ pints cold water.
1 lb. neck or knuckle of mutton.	1 teaspoonful salt.
	1 lb. shin of beef.

Method.—Wipe the three pieces of meat well with a damp cloth, and cut it all down into small pieces away from the bones. Remove all marrow and fat, but keep the skin. Put into a clean lined saucepan the pieces of meat, bones, and skin. Add the salt, cover with the cold water, and put the lid on the pan. Bring this slowly to the boil, skim well with an iron spoon, and wipe off any scum from round the sides of the saucepan. Allow the soup to simmer slowly from 4 to 5 hours, skimming when necessary. Then strain into a basin, and let it stand till cold. Then carefully remove all fat from the top, and warm as required. This soup may also be served as a jelly.

Note.—A chicken, or part of one, may be cut up and used for making this soup, either along with the other meats or instead of one or other. Or game of any sort may be used. Also small pieces of carefully prepared vegetables may be added, after the stock has been well skimmed. These will make the soup more savoury, but in many cases will not be allowed. Salt even is often prohibited.

Time—4 to 5 hours. Probable cost, 2s. 2d.

7.—FISH SOUP.

Ingredients—

Small haddock, whit- ing, or sole.	1 gill of milk, or
½ oz. butter.	1 yolk of egg, and ½
½ oz. flour.	gill cream.
3 gills or 1 pint cold water.	1 teaspoonful finely chopped parsley.

Method.—Wash and scrape the fish very clean, and see that there is no black skin lining the inside part. Do not remove the skin nor fins, but take out the eyes. Cut the fish across into five or six pieces, and put them into a nice lined saucepan. Cover them with the cold water, and add the salt; bring to the boil, and skim. After the soup has boiled for a few minutes, lift out a few nice little pieces of fish, free from skin and bone, and reserve them for serving in the soup at the end. Do not let them cook until all the flavour has been extracted from them. Allow the rest to simmer slowly for ¾ to 1 hour longer. Then strain through a wire sieve, and rub some of the white pieces of fish through. Rinse out the pan the soup was cooked in; melt in it the butter, add the flour, and mix these two smoothly together, being careful they do not brown. Then pour on the soup that has been sieved, and stir until boiling. Add the milk, pieces of fish which were reserved, and chopped parsley. Let it get quite hot and serve. If yolk of egg and cream are used, first beat them together in a small basin with a fork. Draw the soup to the side of the fire, where it will be off the boil, and strain them in through a fine strainer, stirring all the time. The soup must not boil after the yolk of egg is added, or it will curdle. If vegetable flavourings are allowed, a small amount of thinly sliced vegetables may be cooked with the soup, also a bay leaf, small blade of mace, and some parsley stalks. If butter is not allowed, put the soup first into the pan, then break the flour until smooth with the milk, and add

it to the soup. Stir until boiling, and boil for a few minutes. Rice flour may be used instead of ordinary flour, or bread crumbs may be sprinkled in.

Time—1½ hour. Probable cost, 4d. to 1s.

8.—STEAMED FISH.

Ingredients—

1 filleted haddock, whiting, or sole.	A pinch of white pepper.
A pinch of salt.	A little butter.
	A squeeze of lemon juice.

Method.—Fillet the fish, unless this has already been done by the fishmonger, and wipe it with a slightly damp cloth. Then cut it into neat sized pieces; grease a soup plate or muffin dish with a little butter, and place the pieces of fish on this. Sprinkle with a little salt and white pepper, if it is allowed, and squeeze over some lemon juice, which helps to keep the fish firm and white, and also aids digestion. Be careful to let none of the lemon seeds drop. Cover the fish with a piece of greased white paper, and then with a lid or basin. Place this over a pan half full of boiling water, seeing that the plate fits well on the pan. Let the water underneath boil quickly, so that there may be plenty of steam, and cook from 20 to 30 minutes, until the fish loses its clear transparent appearance, and looks quite white. If the pieces are thick it will be better to turn them once during cooking. The liquid that is on the plate when the fish is cooked is the juice from the fish, and should be served with it. If a nice dish is chosen to cook the fish on, it may be served up on the same. Dry the plate or dish underneath, remove the paper, and wipe round the edges. This is the lightest and simplest mode of cooking fish for an invalid.

Time—20 to 30 minutes. Probable cost—whiting or haddock, 3d. or 4d.; sole, 9d. to 1s. 6d.

9.—BROILED FISH.

Required—

1 small haddock or 1 whiting.	A little butter. Pepper and salt.
----------------------------------	--------------------------------------

Method.—Have the fish skinned, but not filleted; wipe it with a damp cloth, and then dry it well. If the fish is thick, split it open, season with pepper, salt, and, if liked, a little lemon juice. Have the gridiron very clean, heat it, and grease with a little butter. Lay the fish on it, and broil over or before a very clear fire, so that it may not taste smoky. Do not place it too near the fire, or it will be scorched. If broiling on the top of the fire, turn the fish once or twice during the cooking. For broiling in front of the fire, the grid is generally made double, and in that case the fish would be put between the two sets of ribs so that it can easily be turned. The time for broiling depends upon the thickness of the fish. The thicker the fish, the more slowly it must be cooked. For a small haddock or whiting, from 10 to 12 minutes will be sufficient. Serve very hot, with a little cold butter. Broiling is more wholesome than frying.

Time—10 to 12 minutes. Probable cost, 3d. to 4d.

10.—FISH CREAM.

Ingredients—

½ lb. uncooked fish.	½ gill cream.
½ oz. butter.	1 white of egg.
1 oz. bread crumbs.	Pepper and salt.
½ gill milk.	A squeeze of lemon juice.

Method.—Weigh the fish free from skin and bone, and shred it down finely with a knife. Put it into a mortar, and pound it well. Rinse out a small saucepan with cold water to prevent the mixture

sticking to it. Put into it the butter and the milk, and let the butter melt over the fire. Then add the bread crumbs, and stir with a wooden spoon over the fire until the bread crumbs swell and the mixture thickens. Add this mixture to the fish in the mortar, pound well together, and rub through a wire sieve, scraping the sieve well underneath. Put the mixture into a basin, and season to taste. Put the white of egg on to a plate, and beat it up to a stiff froth with a knife. Put the cream into a smaller basin, and whisk it with a fork until thick. Add both these to the fish mixture, and stir them in as light as possible with an iron spoon. Mix them lightly, and, at the same time, thoroughly. Pour the mixture into a small greased basin, greased out with clarified butter. The basin must not be more than three parts filled. Twist over the top of it a piece of greased kitchen paper. Place the basin in a saucepan with enough hot water to come half way up the sides of the basin. Put the lid on the pan, and steam slowly for 15 minutes, or until the cream feels firm to the touch. Lift out, and let it stand for a minute or two, to let the steam escape. Loosen round the edges, and turn carefully out on to a hot plate. Serve plain, or with a little white sauce round.

Time—15 minutes. **Probable cost**, 5d. or 6d.

11.—FISH OMELET.

Ingredients—

2 oz. cooked fish.	2 eggs.
1 teaspoonful chopped parsley.	Pepper and salt.
	1 oz. butter.

Method.—Have the fish free from skin and bone, and chop it finely. Separate the yolks from whites of the eggs. Put the yolks into a medium-sized basin and the whites on to a plate. Add to the yolks the chopped fish, parsley, pepper, and salt, and work these well together with a wooden spoon until of a creamy consistency. Beat up the whites of the eggs on the plate with a broad-bladed knife, until so stiff that you could turn the plate upside down without the whites falling off. Remove the wooden spoon from the basin, and, with an iron one, stir into it the beaten whites lightly and thoroughly. Melt the butter in an omelet pan, and pour the mixture into it, scraping out the basin as quickly as possible. Stir the mixture round with an iron spoon until it begins to set, stirring mostly on the surface and not scraping the foot of the pan. Then hold it a little longer over the fire until the omelet is nicely browned on the under side. Slip a knife under it, and double over first from one side and then from the other towards the centre. If not quite cooked on the top, hold it in front of the fire for a minute or two. Then turn it on to a hot dish with a doily or fish paper below it, and serve as quickly as possible.

Time—5 minutes. **Probable cost**, 4d. to 8d.

12.—GRILLED OR BROILED CHOP.

Required—

1 loin chop.	Maitre d'hôtel butter.
--------------	------------------------

Method.—A chop from the loin is considered the best. They are also cut from the best end of the neck and the fillet of the leg. The chop should be cut at least half an inch thick, and the meat must not have the slightest taint. Wipe the chop with a damp cloth, then trim it neatly, removing nearly all the fat. Have a clear fire, and if there is any smoke or a blaze, sprinkle a handful of salt over it. See that the grill or the gridiron is perfectly clean, make it thoroughly hot, and grease it with a piece of mutton fat or a little butter. Place the chop on it, and grill over or in front of the fire, turning it every minute or two until the chop is cooked sufficiently.

The time for cooking depends very much upon individual taste, and also upon the thickness of the chop. It is more digestible underdone than overdone. The outside should be well browned, and the inside red and juicy. When turning the chop use a pair of steak tongs or two knives, or a fork stuck into the fat of the meat. Never stick a fork into the meat itself, or it will let out the juices. If the chop appears to be cooking too quickly, raise the gridiron, or remove it a little distance from the fire. In lifting the chop from the gridiron, place it on a very hot plate. A chop, to taste well, must be served up at once. A small pat of maitre d'hôtel butter may be placed on the top, or a little ketchup may be served with it, if allowed.

Note.—Never warm up a chop for an invalid.

Time—7 to 8 minutes. **Probable cost**, 4d.

13.—MAÎTRE D'HÔTEL BUTTER.

Required—

$\frac{1}{2}$ oz. butter.	$\frac{1}{2}$ teaspoonful lemon juice.
$\frac{1}{2}$ teaspoonful chopped parsley.	

Method.—Put all on to a plate, and with a knife work them well together, to form a neat pat. Stand the plate slightly on end, that the lemon juice may run out of the butter again; and set in a cool place, or on ice, until wanted. The parsley should be very green and very finely chopped to make this butter look well.

14.—VEAL OR CHICKEN CREAM.

Ingredients—

$\frac{1}{4}$ fillet of veal, or breast of chicken.	$\frac{1}{2}$ ounce of butter.
$\frac{1}{2}$ gill milk, or white stock.	1 small blade of mace.
1 oz. of bread crumbs.	$\frac{1}{2}$ gill of cream.
	1 white of egg.
	Pepper and salt.

Method.—Wipe the meat with a damp cloth, and shred it very finely, or put it through a mincing machine. Make a panada with the bread crumbs, butter, and milk, or white stock. Put the butter, milk, and a small blade of mace, if liked, into a small lined saucepan, and heat over the fire until the butter is melted. Then add the bread crumbs, and stir over the fire for a few minutes until the bread crumbs swell and the mixture thickens. Lift out the mace, and put the panada into a mortar, with the minced meat; pound well together, and rub through a fine wire sieve. Scrape under the sieve. Put the mixture into a basin, and add the seasoning. Whisk the cream in a small basin with a fork until thick, and beat up the white of egg stiffly on a plate. Add both these to the meat mixture, and stir them lightly in with an iron spoon. Pour into a well greased basin or mould, not filling it more than three-parts full (as the mixture rises), and cover over the top with a piece of greased white paper. Place this in a saucepan, with a plate or saucer at the foot of it, and enough boiling water to come half-way up the sides of the basin or mould. Put the lid on the pan, and steam very slowly from 20 to 30 minutes, until the cream is well risen and firm to the touch. The plate or saucer at the foot of the pan is to raise the cream above the great heat of the foot of the saucepan. The water round it must only be allowed to simmer very gently, and if it boils away more must be added. On lifting out, allow the cream to stand for a minute or two, to let some of the steam escape, or it is apt to crack. Loosen round the edges, and turn carefully out on to a hot dish. White sauce may be served over or round it if wished.

Time, 20 to 30 minutes. **Probable cost**—veal, 7d. or 8d.; chicken, 1s. to 1s. 3d.

15.—STEWED PIGEON.

Required—

1 pigeon.	$\frac{1}{2}$ teaspoonful flour.
$\frac{3}{4}$ oz. butter.	Pepper and salt.
$\frac{1}{2}$ pint stock.	$\frac{1}{2}$ slice toast.

Method.—Prepare and truss the pigeon as for roasting, and coat it over with the flour. Melt the butter in a small stewpan. When smoking hot, put in the pigeon, and brown it on all sides. Keep turning it over with a spoon, so that it may get a uniform brown colour all over. Then lift it on to a plate, and pour away all the grease that is left in the pan. Pour in the stock, and let it become warm over the fire, and then return the pigeon. Put the lid on the pan, and allow the bird to stew very gently from 1 to 2 hours, according to age and size. Sometimes a much longer time will be required. When about half cooked turn the pigeon over on to its other side. When quite tender, lift it out on to a neat square of toast, and remove the trussing string from it. Reduce the gravy in the pan by allowing it to boil quickly without the lid, until there is just enough left for serving. Keep it well skimmed, that it may be quite free from grease, and then pour it round the pigeon. Garnish with a sprig of parsley or a little watercress.

Time, 1 to 2 hours. Probable cost, 1s. to 1s. 4d.

16.—STEWED SWEETBREAD.

Ingredients—

1 heart sweetbread.	1 tablespoonful cream.
1 gill of white stock.	White pepper and salt.
1 teaspoonful arrowroot.	

Method.—Soak the sweetbread in cold water from 1 to 2 hours. Then put it into a saucepan with cold water to cover it. Bring to the boil, and let it boil for 5 minutes. Then lift it out into a basin of clean cold water to cool it. This preserves the colour of the sweetbread. Then remove from it all fat and skin, pulling them off with the fingers, and break the sweetbread into small pieces of an equal size. Put these pieces into a small lined stewpan with the stock, put the lid on the pan, and simmer very slowly until tender. When sufficiently cooked, lift the pieces of sweetbread out, and place them on a neat square of toast on a hot dish, and keep them warm. Break the arrowroot in a small basin with a little cold water, and add it to the stock in the pan. Stir over the fire until boiling, and boil for five minutes, so as to thoroughly cook the arrowroot. Add the cream, and season to taste. A yolk of egg may be used instead of the cream, or the sauce may be left without either. Pour the sauce over the sweetbread, and serve very hot.

Note.—Milk may be used instead of stock for stewing the sweetbread. A sweetbread must be cooked when very fresh. None of the internal meats, such as liver, kidneys, sweetbreads, &c., should be kept for any length of time. Lambs' sweetbreads are the most delicate, and can be cooked in the same way.

Time—1½ to 2 hours. Probable cost, 1s. to 1s. 6d.

17.—TO PREPARE TRIPE.

Tripe is the inner lining of the stomach of the ox and the cow. It is extremely nourishing and suitable for invalids, being as easy of digestion as chicken. The best kinds are those known as the "blanket" or "double" (because it is folded with fat between the "honeycomb," so called from its cellular appearance, and the "monk's hood," which is much darker in colour). Tripe requires very careful cleaning and boiling before it can be used. First wash it well in several waters, and scrape it with a knife, pulling away any pieces of fat

from it. Cut it into pieces, and put it into a clean saucepan, with cold water to cover it, and bring it to the boil. Pour this water away, and repeat this until the tripe has no unpleasant smell. Then rinse the saucepan well, put in the tripe with cold water to cover it, bring it to the boil, and cook slowly from 10 to 12 hours. As the water boils away, more cold water must be added. If allowed to boil too quickly, the tripe will become hard. When sufficiently cooked, it ought to be so tender that it will pull easily in pieces when you try it with the fingers. Pour it out into a basin, and cover it with the liquor in which it was cooked, and this will prevent its becoming hard and dry. It is then ready for making up in any way you may wish. In England you can buy the tripe all ready prepared from the butcher, but in Scotland it always requires this long slow boiling first.

18.—STEWED TRIPE.

Ingredients—

$\frac{1}{2}$ lb. tripe.	$\frac{1}{2}$ oz. flour.
$\frac{1}{2}$ gill of milk.	Pepper and salt.
$\frac{1}{2}$ gill of tripe liquor.	Some sippets of toasted bread.
$\frac{1}{2}$ oz. butter.	

Method.—Prepare the tripe according to directions given, and cut it into small neat pieces. Melt the butter in a small pan, add the flour, and mix smoothly together with a wooden spoon. Pour in the milk and tripe liquor (the water in which the tripe was cooked), and stir over the fire until boiling. Lay in the pieces of tripe, put the lid on the pan, and stew slowly by the side of the fire for about 15 minutes. Season to taste, and serve hot with neat little sippets of toast round the dish.

Note.—If liked, half an onion may be boiled with the tripe for the last half-hour, then chopped up, and put into the stew. Or a stick of celery well washed and brushed may be used instead of onion. The yolk of an egg or a little cream may be stirred into the stew just before serving. Instead of using the milk given in the recipe, a $\frac{1}{2}$ gill of purée, made from fresh tomatoes, being rubbed through a sieve, may be substituted.

Time—15 to 20 minutes, after the tripe is prepared. Probable cost, 5d. to 7d.

19.—SPINACH.

Spinach reduces so enormously in cooking, that 1 lb. will make a very small dish. Double the leaves lengthways, and strip off the stalks. Then wash the spinach thoroughly in several waters until it is quite free from grit. It is a vegetable which requires most particular washing, growing as it does so near the ground. It is very earthy, and takes much water to make it clean. Handle it as lightly as possible, as touching it too much with the hands causes the leaves to lose all their crispness. Put it into a saucepan, without any water except that which adheres to the leaves; sprinkle it with salt, and put the lid on the pan. Spinach is the only green vegetable which is cooked with the lid on the pan; but as no water is used, were the lid left off, evaporation would be so great that the spinach would soon burn. The green of it is so intense that there is no fear of its discolouring unless it is cooked too long. Cook until it is quite tender, from 20 to 30 minutes, stirring frequently with a spoon. When ready, drain it well on a fine wire sieve, with a basin below it, and press out as much water as possible with the back of a wooden spoon. Then remove the basin, put a clean dry plate underneath the sieve, rub the spinach through the sieve on to this, and scrape the sieve well underneath. Return the spinach to a saucepan, with a small piece of butter, pepper,

and salt if necessary. Stir over the fire until thoroughly hot, add a squeeze of lemon juice, and, if liked, a little cream; but do not make the spinach too moist. Arrange it in a neat pyramid on a hot dish, marking it up the sides with the back of a fork, and garnish round the base with small sippets of toast or fried bread. Spinach is a particularly wholesome vegetable, and very easy of digestion. A poached egg served on the top of it will make a nice dinner for an invalid.

20.—ARROWROOT PUDDING.

Ingredients—

$\frac{1}{2}$ oz. arrowroot.	1 egg.
$\frac{1}{2}$ pint milk.	1 teaspoonful sugar.

Method.—Break the arrowroot with a little of the cold milk, and, when smooth, pour on the rest of the milk. Rinse out a small lined saucepan, and put the arrowroot and milk into it. Stir constantly over the fire with a wooden spoon, until it boils and thickens, and let it boil for fully 5 minutes. Remove the pan from the fire, and add the sugar and any flavouring that may be wished. Separate the yolk from the white of the egg, putting the yolk into a cup or small basin, and the white on to a flat dinner plate. When the arrowroot has cooled a little, add the yolk to it and mix it in. Add a pinch of salt to the white, and with a broad-bladed knife beat it up to a stiff froth. Stir this lightly into the mixture, and pour into a greased pie dish, wiping round the edges of the dish. Bake in a moderate oven until well risen, and of a nice light brown colour. Lift out, sprinkle a little sugar over it, and serve as quickly as possible, as it soon falls if allowed to stand.

Note.—Arrowroot, like corn flour, although a valuable food, is not sufficiently nourishing in itself to maintain strength. It is one of the purest forms of starch obtained from the root of a plant of the Arum tribe. It is a heat and force producer, but is lacking in flesh-forming elements. Therefore when given as a meal to invalids or children it should always be made with milk, and not water, which will supply the properties that are wanting.

Time—20 minutes. Probable cost, 3d.

21.—SEMOLINA PUDDING.

Ingredients—

$\frac{3}{4}$ oz. semolina.	1 egg.
$\frac{1}{2}$ pint milk.	1 teaspoonful sugar.

Method.—Rinse out a small lined saucepan with cold water, and put the semolina and milk into it. Stir these over the fire with a wooden spoon until boiling, and boil for a few minutes, until the semolina swells and thickens. Then remove the pan from the fire, and add the sugar and any seasoning; and, when it has cooled a little, drop in the yolk of the egg, and mix it well. Beat up the white on a plate with a knife until it is a stiff froth; then mix it in lightly but thoroughly. Pour the mixture into a small greased pie dish, wiping round the edges of the dish. Bake in a moderate oven for about 10 minutes, until nicely browned. Lift out, sprinkle with sugar, and serve without delay. If there is no oven, this pudding can be finished off in front of the fire.

Note.—Semolina is a very fine grain, and yellow in appearance. It is made from the red wheats which grow on the banks of the Danube. This wheat is of the richest and most nourishing kind. Semolina is flesh-forming as well as force-producing, and is one of the most valuable of our farinaceous foods.

Time—20 minutes. Probable cost, 3d.

22.—BAKED CUSTARD PUDDING.

Ingredients—

2 yolks & 1 white of egg.	1 teaspoonful sugar.
$1\frac{1}{2}$ gill of milk.	Flavouring.

Method.—Put the yolks and white of egg into a basin, with the sugar and any flavouring that is used, and beat them well together with a fork. Pour on the milk, and mix again. Strain the custard into a greased pie dish, and wipe round the edges of the dish. Stand the pie dish in a Yorkshire pudding-tin, with some cold water round it. Bake in a moderate oven from 15 to 20 minutes, until firm to the touch, and nicely browned. The water in the tin tempers the heat, and prevents the custard from curdling. When cooking a larger custard, it is a good plan to keep adding a little cold water occasionally, so that the water in the tin may never get too hot. Do not shake the custard when it is put into the oven, or it will become perforated. A perfect custard should be the same throughout. When ready, lift out, sprinkle with sugar, and serve hot or cold. Stewed fruit is nice served along with it. The custard can be made richer by using yolks of eggs alone. Three yolks to $1\frac{1}{2}$ gill of milk. A thin slice of sponge cake, or a water biscuit, may be placed on the top of the custard before baking.

Time—20 minutes. Probable cost, 3d. or 4d.

23.—SWEET OMELET.

Ingredients—

2 eggs.	1 tablespoonful rasp-
$\frac{1}{2}$ oz. sugar.	berry or strawberry
A little flavouring.	jam.

Method.—Take a small frying or omelet pan, grease it out well with clarified butter, and let the butter set on it. Put the yolks of eggs, sugar, and flavouring into a medium-sized basin, and work them well together with a wooden spoon, until of a creamy consistency and pale in the colour. Put the white on to a flat dinner plate, add a pinch of salt to them, and, with a broad-bladed knife or spatula, beat them to a stiff froth. They should be so stiff that you can turn the plate upside down without their falling off. Then with an iron spoon stir them lightly in among the yolks and sugar. Keep turning the mixture over and over until all is thoroughly mixed. Set the omelet pan on the stove, and pour the mixture into it, scraping out the basin well. Hold the pan over the fire for a few seconds, then place it in a rather quick oven from 7 to 10 minutes, until well risen, brown, and firm to the touch. When the omelet is cooking, have the jam put into a saucepan to heat, and a piece of paper laid out, and sprinkled with sugar. Turn the omelet out on to the sugared paper, put the jam in the centre, and fold over. Lift the omelet on to a hot plate with a folded paper or dish paper and serve at once.

Note.—The jam is heated, because cold jam would make the omelet heavy. The paper is sugared to prevent the omelet sticking to it. If the omelet is allowed to stand after it is ready, it will get heavy. The jam may be omitted, and the omelet served plain, or some stewed fruit may be used instead of the jam. Always remember that the handle of the omelet pan is hot, and must be held with a cloth. Hands have sometimes been badly burned through forgetfulness of this.

Time—10 minutes. Probable cost, 4d.

24.—STEWED PRUNES.

Ingredients—

$\frac{1}{4}$ lb. prunes.	Cold water.
2 oz. granulated sugar.	Rind of $\frac{1}{2}$ lemon.

Method.—Wash the prunes well, and put them into a basin with the sugar, and enough cold water to cover them. Cover the basin, and, if possible, let the prunes soak over night. If this cannot be done, let them soak as long as possible. They swell much better, and cook more quickly, when thoroughly soaked. Then put them into a lined saucepan with the water and sugar in which they have been soaked, and add the thinly peeled rind of half a lemon. Put the lid on the pan, and stew slowly for about 20 minutes, or until the prunes are quite soft. When cooked sufficiently, the stones should slip out quite easily. Lift the prunes out on to a dish, and strain the juice over them to keep back the lemon rind. Sometimes a little port wine is added. Cinnamon or cloves may be used for flavouring instead of lemon rind. The prunes may be stewed in a jar instead of a saucepan. Stand the jar in a saucepan of boiling water, and keep the water boiling round them until they are soft. They will take a longer time to cook in a jar.

Time—20 minutes after soaking.

Probable cost, 6d. to 10d. per lb.

25.—BLANC-MANGE.

Ingredients—

1 gill of milk.	Rind of $\frac{1}{2}$ lemon.
1 gill of cream.	1 oz. sugar.
$\frac{1}{4}$ oz. isinglass.	

Method.—Rinse out a small saucepan, and put into the milk isinglass and thinly peeled rind of half a lemon. Let this stand by the side of the fire until the isinglass is dissolved, and the milk well flavoured with the lemon. Stir occasionally, but do not let it boil. Add the sugar, and strain into a basin to keep back the lemon rind. Add the cream, and stir occasionally until nearly cold. If not stirred, the milk and cream will separate. Then pour into a small basin or mould that has been rinsed out with cold water, and put aside in a cool place to set. When wanted, turn out on a clean cold dish, and serve.

Note.—A little black or red currant jelly may be served with blanc-mange.

Time— $\frac{1}{2}$ hour. **Probable cost**, 6d.

26.—PORT WINE JELLY.

Ingredients—

3 gills port wine.	1 inch cinnamon stick.
1 gill water.	Rind and juice of 1 lemon.
1 tablespoonful red currant jelly.	1 oz. French sheet gelatine, or $\frac{1}{2}$ oz. isinglass.
2 oz. loaf sugar.	

Method.—Take a clean lined saucepan, rinse it out with cold water, and put into it the port wine (a pint bottle holds three gills), water, gelatine or isinglass, sugar, red currant jelly, and cinnamon stick. Let these soak while the lemon is prepared. Wipe the lemon with a damp cloth, and peel the rind of it very thinly. Then roll it on the table to soften it, cut it in two, and squeeze out the juice. Strain the juice into the saucepan beside the other ingredients, and add the lemon rind. Stir all these over the fire until dissolved, then draw the pan to one side, and simmer very slowly for about 10 minutes. Strain through a piece of muslin that has been rinsed in hot water, and set aside till cold.

Time—15 minutes. **Probable cost**, 2s. to 2s. 6d.

27.—APPLE JELLY.

Ingredients—

1 lb. apples.	$\frac{1}{2}$ oz. French sheet gelatine, or $\frac{1}{4}$ oz. isinglass.
3 oz. sugar.	
$1\frac{1}{2}$ gill cold water.	$\frac{1}{2}$ gill cold water.
Grated rind and juice of $\frac{1}{2}$ a lemon.	

Method.—Wipe the apples with a damp cloth, cut them in quarters, peel, and take out the cores. Slice them down thinly, and put them into a small lined stewpan, with the $1\frac{1}{2}$ gill of water, sugar, and grated lemon rind. Put the lid on the pan, and allow them to simmer slowly until reduced to a pulp; then rub through a hair sieve into a basin. Dissolve the gelatine or isinglass in the $\frac{1}{2}$ gill of cold water, and strain it into the apple pulp. Stir until nearly cold, pour into a wetted mould or basin, and put in a cool place until set. Turn out, and serve cold. A little cream may be served with it.

Time— $\frac{1}{2}$ hour. **Probable cost**, 6d. to 8d.

28.—ORANGE JELLY.

Ingredients—

1 gill orange juice.	$1\frac{1}{2}$ oz. loaf sugar.
1 gill cold water.	$\frac{1}{2}$ oz. French sheet gelatine, or $\frac{1}{4}$ oz. isinglass.
Rind of 1 orange.	
Juice of 1 lemon.	

Method.—Wipe one of the oranges, and peel the rind off it as thinly as possible. Put this into a small lined saucepan with the water, sugar, and gelatine or isinglass. Let these simmer over the fire for 10 minutes, then skim, and strain into a basin. Strain the orange and lemon juice into this, and pour into a wetted mould or basin. Put into a cool place until set, then turn out, and serve. Some plain or whipped cream may be served with it.

Note.—This jelly may be whipped.

Time—15 minutes. **Probable cost**, 6d.

29.—RESTORATIVE JELLY.

Ingredients—

1 lb. shin of beef.	1 lb. knuckle of veal.
1 calf's foot or one piece of ox foot.	3 pints of cold water.
	A pinch of salt.

Method.—Prepare the ox or calf's foot in the same way as for calf's foot jelly. Wipe both pieces of meat with a damp cloth, and cut the meat into small pieces away from the bone, keeping back all marrow and fat. Put the meat, bones, and piece of ox or calf's foot into a lined saucepan, with a little salt and the cold water. Bring to the boil, and skim well. Simmer slowly from 5 to 6 hours until reduced to about half the quantity. Strain through a hair sieve into a basin, and stand till cold. Carefully remove all fat from the top, and the jelly is ready for serving.

Note.—This may also be warmed, and served hot as a soup. Wine may be added to the stock when it is being strained.

Time—5 to 6 hours. **Probable cost**, 1s. 6d.

30.—OATMEAL GRUEL.

Ingredients—

1 tablespoonful fine oatmeal.	$\frac{1}{2}$ pint cold water.
	Salt or sugar.

Method.—Put the oatmeal into a clean basin, and pour the water over it. Cover the basin over to keep the dust from it, and let it stand for at least half-an-hour, stirring occasionally. Then strain the liquid off into a small lined saucepan, and press the oatmeal as dry as possible. Stir over the fire until boiling, and let it boil from 5 to 7 minutes. The thickness of the gruel is very much a matter of

taste; if too thick, more water can be added; or if too thin use more oatmeal. Season to taste with salt or sugar. A small piece of butter may be added, and wine or brandy if required. Serve very hot.

Note.—Oatmeal powder can be used instead of oatmeal. The gruel would then be made according to directions given for barley meal gruel.

Time—10 minutes after soaking.

Probable cost, 1d.

31.—MILK GRUEL.

Ingredients—

1	tablespoonful fine	½ pint of milk.
	oatmeal.	Salt or sugar.

Method.—Prepare in exactly the same way as last recipe, using the milk in place of the water. Season to taste with salt or sugar. A small piece of butter may be added, and wine or brandy as required. Serve very hot.

Note.—An egg may be beaten up and added if wished; or it may be served with cream.

Time—10 minutes after soaking.

Probable cost, 1½d.

32.—THICK BARLEY WATER.

Ingredients—

2 oz.	pearl barley.	Rind and juice of ½ lemon.
2	pints cold water.	Sugar to taste.

Method.—Wash the barley well, and put it into a saucepan with cold water to cover it. Bring this water to the boil, and then pour it away. Rinse the barley with cold water, and rinse out the saucepan. (This is to blanch the barley, and if it were not done the barley water would have a dark-coloured, unpleasant appearance.) Return the barley to the saucepan with the 2 pints of cold water, and the thinly peeled rind of half a lemon. Simmer slowly for 2 hours, then strain, sweeten to taste, and strain in the lemon juice. This can be served either hot or cold.

Note.—Barley water can be made without the lemon, and with milk added to it after straining. It is a very nourishing drink, and, from its exceedingly pure taste, is a favourite with most invalids. The barley may be used a second time, more water being added to it, and this is even better.

Time—2 hours. **Probable cost**, 1½d.

33.—CLEAR BARLEY WATER.

Ingredients—

2 oz.	pearl barley.	Rind of ½ lemon.
1	pint boiling water.	Sugar to taste.

Method.—Wash the barley well, and put it into a jug with a thinly peeled rind of a lemon, and a little sugar. Have the water freshly boiling, and pour it on the barley. Cover the jug, and let stand till cold. Strain, and it is ready for use.

Probable cost, 1d.

34.—LEMONADE.

Ingredients—

2	lemons.	1 pint boiling water.
2	or 3 lumps of sugar.	

Method.—Wipe the lemons with a damp cloth, and peel the rind off one of them as thinly as possible. Then roll them on the table to soften them, cut them in two, and squeeze out the juice. (A wooden spoon pressed into the fruit is a capital lemon squeezer.) Strain the juice into a jug, and put the rind and sugar in along with it. Have the water freshly boiling, and pour it on. Cover the jug closely, that

none of the strength may escape, and let stand till cold. Then strain.

Note.—This may be made with less water, and may then have soda or potash water added to it just before serving. The quantity of sugar used must depend upon taste. Lemonade is a beverage which is more popular with invalids than almost any other. Sometimes a small slice from the middle of a lemon is served on the top of the lemonade. It must not be forgotten that the minutest portion of white pith, and also the pips, if allowed to remain, will make the lemonade bitter. Lemonade may be made with barley or rice water, instead of plain water.

Probable cost, 2d. to 3d.

35.—WINE WHEY.

Ingredients—

1	gill of milk.	1 lump of sugar.
½	gill sherry wine.	

Method.—Rinse out a small saucepan, put into it the milk and sugar, and bring them to the boil. When boiling, pour in the sherry wine, and this will curdle the milk. Let it boil up again, and strain through a piece of muslin.

Note.—This makes a very soothing drink, and one that is very easily digested. The curd, which is the heaviest part of the milk, is strained from it.

Time—5 minutes. **Probable cost**, 3d. or 4d.

36.—EGG FLIP.

Ingredients—

1	teacupful of milk.	1 white of egg.
1	teaspoonful of sugar.	

Method.—Boil the milk, and beat up the white of egg pretty stiffly. Pour the boiling milk over the white of egg, stirring all the time. Add sugar to taste, and serve. Sometimes a little pepper is added.

Time, 5 minutes. **Probable cost**, 1½d.

37.—EGG WITH BRANDY AND CREAM.

Ingredients—

1	white of egg.	1	tablespoonful of
1	tablespoonful of		brandy.
	cream.		Sugar to taste.

Method.—Beat up the white of egg pretty stiffly. Add to it the brandy and cream, with a little sugar if wished. Mix very thoroughly, and serve.

Probable cost, 3d.

38.—MILK TEA.

Proportions—

1	teaspoonful of tea.	1	breakfast cupful of milk.
---	---------------------	---	---------------------------

Method.—Heat a small teapot very thoroughly with boiling water, and put in the tea. Put the milk into a small clean saucepan, bring it just to boiling point, and pour in over the tea. Cover the teapot with a cosy, or place it by the side of the stove, where it will keep warm *without boiling*, and allow it to stand for 20 minutes. Then pour off very gently into a cup, or another heated teapot. Do not drain it off to the last drop, and be careful not to disturb the sediment. This will make barely a breakfast cupful of tea; if more is wanted, larger proportions must be used.

Note.—China tea is to be preferred for an invalid. The reason that 20 minutes are required for infusing is that the tannin in the tea combines with the casein in the milk, and forms a curd. This falls to the foot of the teapot, hence the reason for pouring off the tea so gently, in order that this deposit may not be disturbed. This tea is perfectly wholesome, the bitter property of the tea and the heavy part of the

milk both being removed from it. It may be given to a delicate person with impunity. The drink itself contains only the whey and cream of the milk and the refreshing element of the tea.

39.—A CUP OF CHOCOLATE.

Required—

1 cupful of milk.	1 egg.
1 oz. good chocolate.	

Method.—Shred down the chocolate with a knife, and put it into a saucepan with the milk. Stir over the fire until the chocolate is dissolved, but do not boil longer than is necessary. Break the egg, and remove the speck from it; put it into a jug, and beat it up with a wire whisk or a fork. Strain the chocolate over it, stirring all the time, and whisk for a few minutes longer until frothy.

Note.—The amount of chocolate required may vary slightly according to the different kinds, but after one trial of a particular kind any fault can easily be remedied. Avoid cheap chocolate, as it is quite unsuitable. If this way of making it is found too rich, half milk and half water may be used, or the egg may be omitted. If too sweet, use the unsweetened chocolate, which is more expensive, but of which less is required.

Time—10 minutes. **Probable cost**, 4d.

40.—COCOA FROM THE NIBS.

Ingredients—

1 oz. cocoa nibs.	1 pint cold water.
-------------------	--------------------

Method.—Crush the nibs slightly, and if time permits let them soak over night in the cold water. Next day put them into a saucepan with the same water. Put the lid on the pan, and let them simmer slowly from 4 to 6 hours. If the water boils away, more must be added to keep up the quantity. Then strain, and when it has cooled remove the fat from the top. Re-heat as required, and add milk if liked.

Note.—The nibs are the broken kernel of the nut. This makes a much more valuable article of diet than cocoa made from the powder. When well made it is clear like coffee and most refreshing, but somewhat peculiar in flavour.

Time—5 to 6 hours. **Probable cost**, 1d.

41.—POACHED EGG.

Required—

1 egg.	Lemon juice.
A pinch of salt.	A round of toast.
A few drops of vinegar, or	Boiling water.

Method.—Break the egg into a small cup or basin, being careful to keep the yolk whole. Half fill a small saucepan with water, and put it on the fire to boil. Add to it a pinch of salt, and a few drops of vinegar or lemon juice, which will help to keep the white of the egg a good colour. When the water is gently simmering, slip the egg carefully into it. Let it cook slowly for 3 minutes, until the white is set, without being hard. Lift it out with a small fish

slice or perforated spoon, and trim off any ragged edges of white. Place it neatly on a square or round of hot toast, garnish it with a sprig of parsley, and serve at once.

Note.—Butter may be spread on the toast if allowed, or a little boiling milk, enough to soak the toast, may be poured over it. Sometimes a little hot cream is poured over the egg.

Time—3 minutes. **Probable cost**, 1d. or 2d.

42.—OATMEAL PORRIDGE (1).

Ingredients—

1 pint of water.	A pinch of salt.
2 oz. oatmeal.	Sugar (if liked).

Method.—Draw the water fresh, put it into a saucepan, and bring it quickly to the boil. When boiling sprinkle in the meal with the left hand letting it fall through the fingers, and keep stirring all the time with the right. When it begins to thicken, draw the pan to the side of the fire, and add a pinch of salt. Simmer slowly from $\frac{3}{4}$ to 1 hour, and stir occasionally to prevent it sticking to the pan. Or make in a double saucepan, keeping the water in the under part boiling all the time. Cooked in this way it requires little or no attention, and there is no fear of its burning. The thickness of the porridge is very much a matter of taste. More or less oatmeal can be used if desired. Add more salt if necessary, or sugar if liked. Serve with milk or cream.

Time— $\frac{3}{4}$ to 1 hour. **Probable cost**, $\frac{1}{2}$ d.

43.—WHEATEN MEAL PORRIDGE.

Make according to the recipe given for oatmeal porridge. It will take rather a longer time to cook. Wheaten meal porridge is not so heating as oatmeal, and it makes a nice variety.

44.—PRAIRIE OYSTER.

Required—

1 fresh egg.	A pinch of salt.
$\frac{1}{2}$ teaspoonful of vinegar.	

Method.—Put the vinegar into a small cup or wine glass, and break the egg into it whole. Serve at once.

Note.—This is considered one of the most digestible ways of serving an egg.

45.—BANANAS WITH CREAM.

Required—

1 or 2 bananas.	1 teaspoonful sugar.
$\frac{1}{2}$ gill double cream.	1 dessertspoonful orange juice, wine, or liqueur.

Method.—Peel the bananas and cut them in thin slices with a silver knife. Place these in a small glass or fancy dish, and pour over the orange juice, wine, or liqueur. Whip the cream with a fork until thick, add the sugar, and pile it neatly on the top of the bananas.

Probable cost, 4d. to 6d.

END OF VOL. IV.

